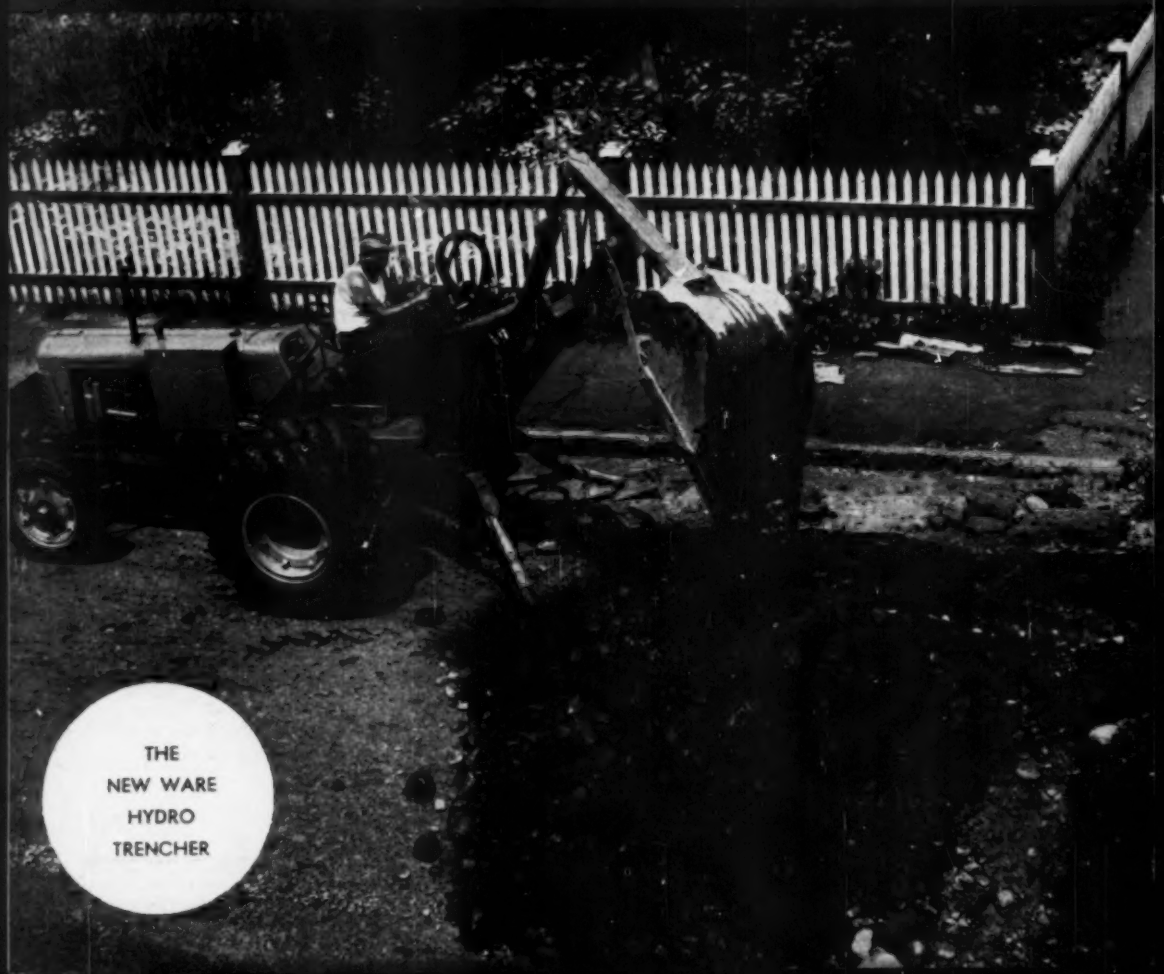
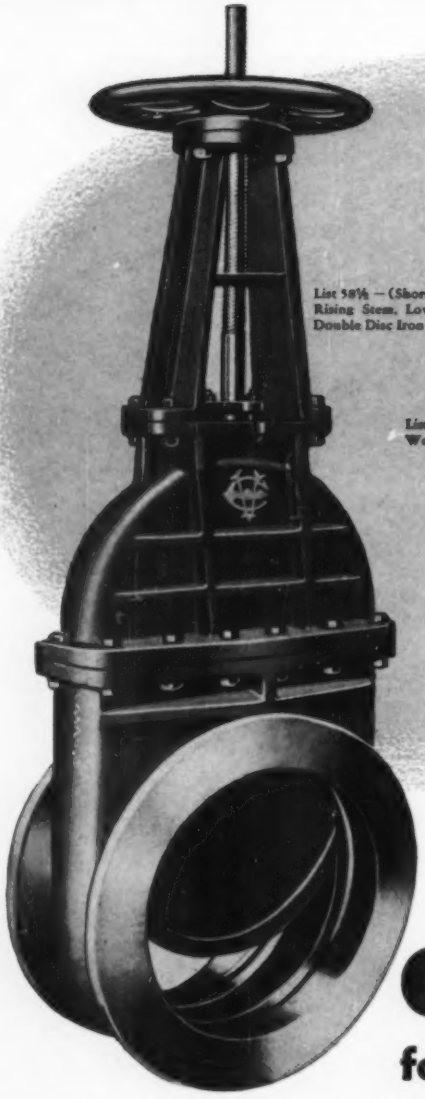
Vol. 97, No. 12 DECEMBER, 1950

WATER & SEWAGE WORKS

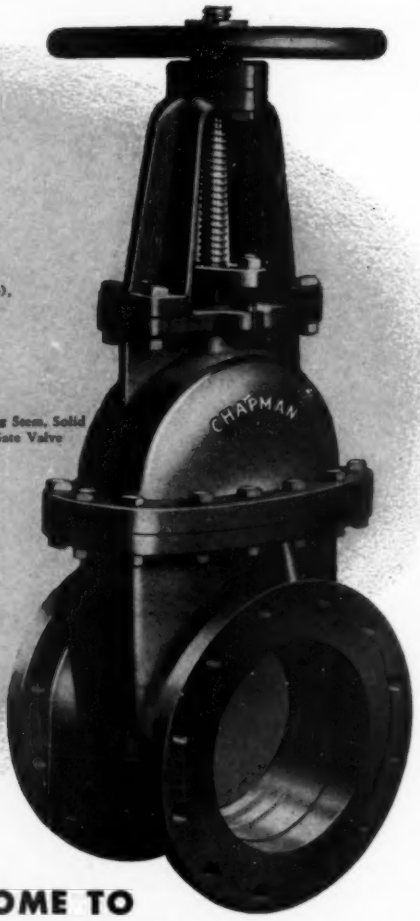
WATER SUPPLY SEWAGE DISPOSAL

INDUSTRIAL WASTE TREATMENT





List 58½ — (Short face to face), Rising Stem, Low Pressure, Double Disc Iron Gate Valve



List 25 — Rising Stem, Solid Wedge, Iron Gate Valve

COME TO CHAPMAN

for Standard Gate Valves

. . . For all purposes . . . For all pressures . . . In all sizes

Be sure to check Chapman first whenever you need standard gate and check valves. Here you'll find iron valves in a complete range of sizes—both solid wedge and double disc types—for a complete range of working pressures from 25 to 800 lbs. for steam, water, oil or gas service. Operation may be by hand wheel, with or without bevel or spur gearing, floor stand, electric motor, hydraulic or pneumatic cylinder.

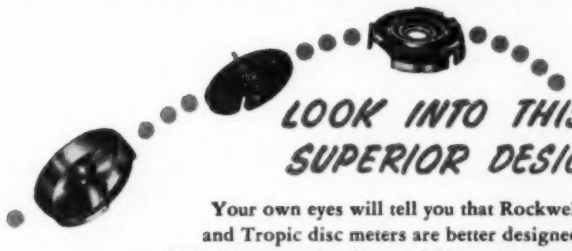
If, however, you need bronze valves — we have them. Just as we have a complete line of steel valves. And valves of many other types such as tilting disc, iron and steel check valves. Whenever special valves for unusual service are required, Chapman engineers will be glad to help you develop them.

The Chapman Valve Manufacturing Company

INDIAN ORCHARD, MASSACHUSETTS

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. December, 1950. Volume 97. Number 12. Published monthly by Gillette Publishing Co., at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second class matter March 4, 1948, at the post office at Mount Morris, Illinois, under Act of March 3, 1879.
Executive and business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

Rockwell Disc Meters



LOOK INTO THIS SUPERIOR DESIGN!

Your own eyes will tell you that Rockwell Arctic and Tropic disc meters are better designed, better built. Every tested and proved disc meter refinement is included in their construction. They are packed with performance for greater accuracy, longer life, lower repair costs. Get the facts now. Write for an eye-opening demonstration.

ARCTIC TYPE
FOR COLD CLIMATES
Size ⅝, ¾, 1 in.
A bronze case meter with breakable frost bottom
TROPIC TYPE
FOR WARM CLIMATES
Size ⅝, ¾, 1 in.
All-bronze, split case construction

Rockwell
MANUFACTURING COMPANY
PITTSBURGH 8, PA.

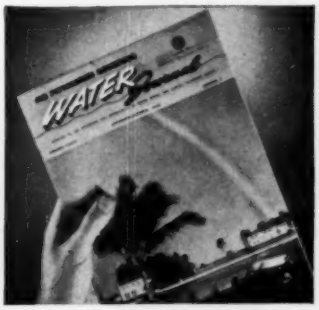
Atlanta • Boston • Chicago • Columbus • Houston • Kansas City
Los Angeles • New York • Pittsburgh • San Francisco • Seattle • Tulsa

MAGAZINE IS 42 YEARS OLD!

PUBLICATION FOUNDED IN 1908 BY THE LATE GEORGE WESTINGHOUSE

ATTAINS 15,000 CIRCULATION

There are probably some old-timers in the water works industry who will remember the early days of the Water Journal. It was a plain booklet of 12 pages, published under the sponsorship of the old Pittsburgh Meter Company. Volume 1, Number 1 came out in May,



1908. It carried a feature article on the new Philadelphia High Pressure Pumping Station. The subject of universal metering, not as popular then as now, was thoroughly discussed. Later, in 1914, the death of George Westinghouse, founder of the Pittsburgh Meter Company was reported with a long list of his accomplishments.

MODERNIZED PUBLICATION

Over the years there have been many changes both in the Water Journal and its friendly sponsors. The Pittsburgh Meter Company is now Rockwell Manufacturing Company. The Water Journal is a thoroughly modernized publication of 20 pages. It is attractively printed, informatively written.

OVER 15,000 DISTRIBUTED

Over 15,000 copies of every issue are now distributed. Are you one of the 15,000 who regularly receive the Water Journal? If not, you are missing some interesting reading. It will keep you posted on the latest trends in operating practices. Thought provoking editorials by Willard F. Rockwell, Board Chairman, will keep you abreast of current events and their effect on the industry. You'll get a chuckle or two from the cartoons and joke columns.

The Water Journal is published by Rockwell Manufacturing Company as a service to the trade. We will gladly add your name to the mailing list. Write the Editor at 400 North Lexington Ave., Pittsburgh 8, Pa.

Wells getting plugged up?

Inquire within

... for detailed information on the most effective agent yet developed for restoring the capacity of wells

HAGAN HALL BUROMIN CALGON

calgon, inc.

A SUBSIDIARY OF HAGAN CORPORATION

HAGAN BUILDING PITTSBURGH 30, PA.

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor*

COMING!

Water Supply in 1950

Will constitute the annual review of developments and trends in water supply and water treatment during the year 1950. It has become our custom to print such annual reviews of water supply developments in the January issue each year. This year we have been fortunate enough to secure as the reviewer the President of the Am. Water Works Assn.—

W. VICTOR WEIR, Pres. & G.M.,
St. Louis County Water Co., St. Louis, Mo.

Sewage and Industrial Waste Disposal—1950

The annual review of developments and trends in sewage and industrial wastes disposal during 1950 will appear in our February 1951 issue. Again we feel privileged to announce that the reviewer is no less than the President of the Federation of Sewage and Industrial Wastes Associations—

RALPH FUHRMAN, Supt.,
Sewage Treatment Works, Washington, D.C.

Water Treatment Experiences

A well qualified chemist and superintendent of water treatment with varied experience and keen observation sets forth some of his "Experiences in Water Treatment" in a series of articles, designed to be helpful to the less experienced and interesting to all. The author of this new series, which began in our January issue, is—

ALBERT H. ULLRICH, Supt.,
Water & Sewage Treatment, Austin, Tex.

Painting Experiences at a Sewage Treatment Plant

The results of a study made of paints and painting practices most effective for preserving equipment and structures at a sewage treatment plant should prove of great value to all sewage works operators and engineers. These studies were made by, and are being reported upon by—

THOMAS T. HAY,
Sup't. Sewage Treatment, Racine, Wis.

Statistical Evaluation of Analytical Data

Is being set forth in a series of articles which explain this little used but highly useful "tool," which can be applied to secure the most accurate and dependable interpretation of analytical, experimental, or plant operating data. The fourth of this series is scheduled to appear in January. The author, who is a pioneer in the development and use of statistical approach procedure in evaluating stream conditions, and plant operating results, in pollution control practice is—

Prof. CLARENCE J. VELZ,
Univ. of Michigan, Ann Arbor, Mich.

How is Your "C" Line?

Many of our readers will recall an earlier article bearing this caption. It dealt with the importance of knowing the friction coefficient or "C" value of arterial and distribution mains and described simplified methods of determining friction losses and fire flows from hydrants. The original article has now been revised and brought up to date by—

D. R. TAYLOR, Gen'l. Mgr.,
Mobile Water Co., Mobile, Ala.

Cost of Maintaining and Operating Construction Equipment

Constitutes a valuable record of what the exact costs are for maintaining and operating a variety of machines used in water works and sewerage construction and operation. Carefully kept costs are compared with costs of renting such equipment and, therefore, have a dual value to water and sewage works managers contemplating the purchase of construction and maintenance equipment and machines. The author, well known to readers of *Water & Sewage Works*, is—

SHERMAN L. ROGERS, Distrib. Supt.,
Metro. Water Bureau, Hartford, Conn.
New York Univ., New York.

Sewer Maintenance & Operation

Is the subject of a series of short pithy articles by an operator who is an advocate of "Special Tools for Special Work," as a safety and time saving economy measure. He is—

REUBEN F. BROWN, Former Supt.,
Sewer Maint. & Operation, Los Angeles.

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*MEMBER

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2 decades of CLEAN

22 Years of 'Round-the-Clock Operation Proves Dependability of G-E Equipment

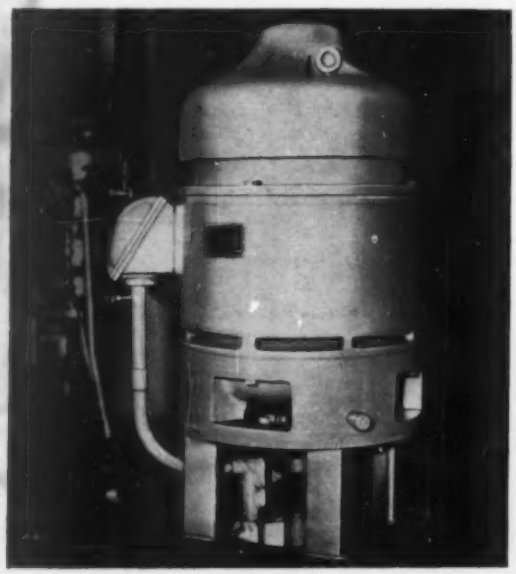
Backed by General Electric motors and control, the Greater Greenville Sewage Treatment and Disposal Plant has maintained Clean Waters for the people of Greenville, S.C. for the past 22 years.

The present installation includes some 57 G-E motors, 3 G-E generators, and a wide variety of G-E control equipment. According to the operating superintendent, General Electric equipment has never let them down during the 22 years of continuous operation—a good indication of the kind of service you can expect from G-E co-ordinated electrification.

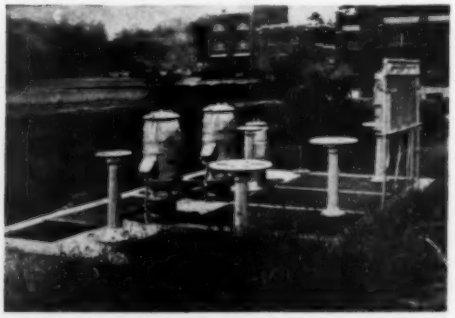
In 1951, this far-sighted city expects to meet the new demands of its expanding population with a complete modernization and expansion of its pollution-control facilities.

General Electric can help you, your consulting or city engineer, and your contractor in (1) winning public support with the complete G-E packaged program "Modern Sewage Treatment" including the full-color sound movie Clean Waters, and (2) by assisting in the formulation of electrical plans.

Make your pollution-control program a success by contacting your G-E representative early in the planning stage. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*



The present Greenville plant has 8 G-E motor-driven pumps. The above 20-hp vertical dripproof unit is coupled to a centrifugal pump for raw sewage. The cast-iron construction is highly resistant to corrosion.

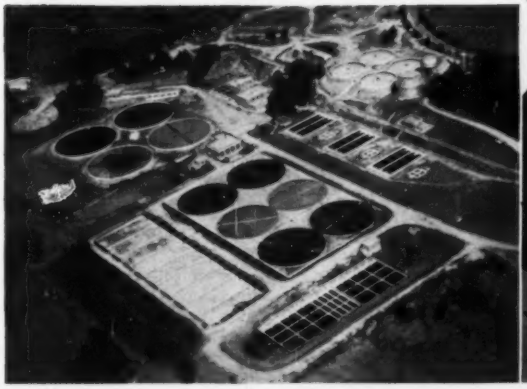


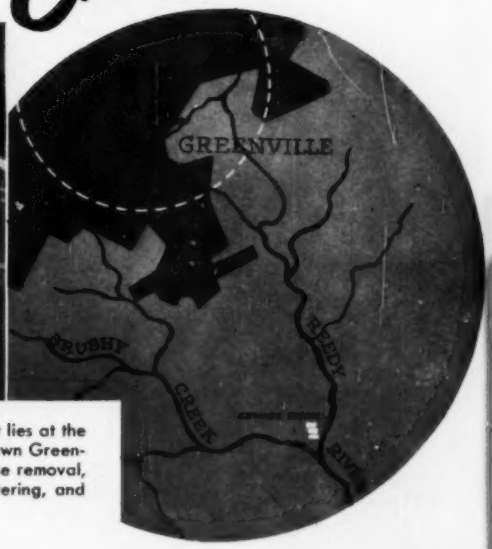
Recirculation from filters to raw sewage is accomplished with G-E motor-driven pumps. Full-voltage starters are mounted in watertight enclosures (right).

GENERAL ELECTRIC

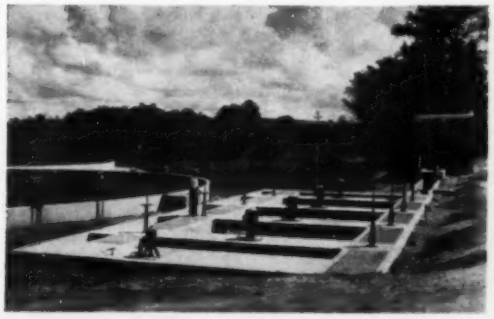
666-59

WATERS *at Greenville*

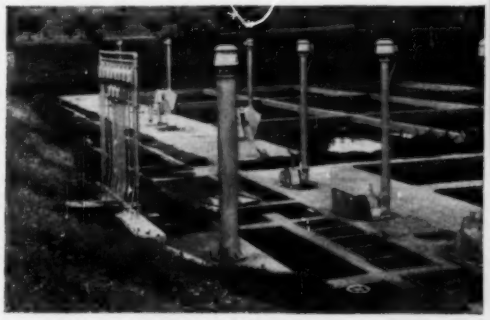




The Greater Greenville Sewage Treatment and Disposal Plant lies at the junction of Brushy Creek and Reedy River, 5 miles from downtown Greenville, S. C. Treatment includes coarse screening, grit and grease removal, pumping, aeration, primary and final clarification, trickle filtering, and sludge digestion and drying.

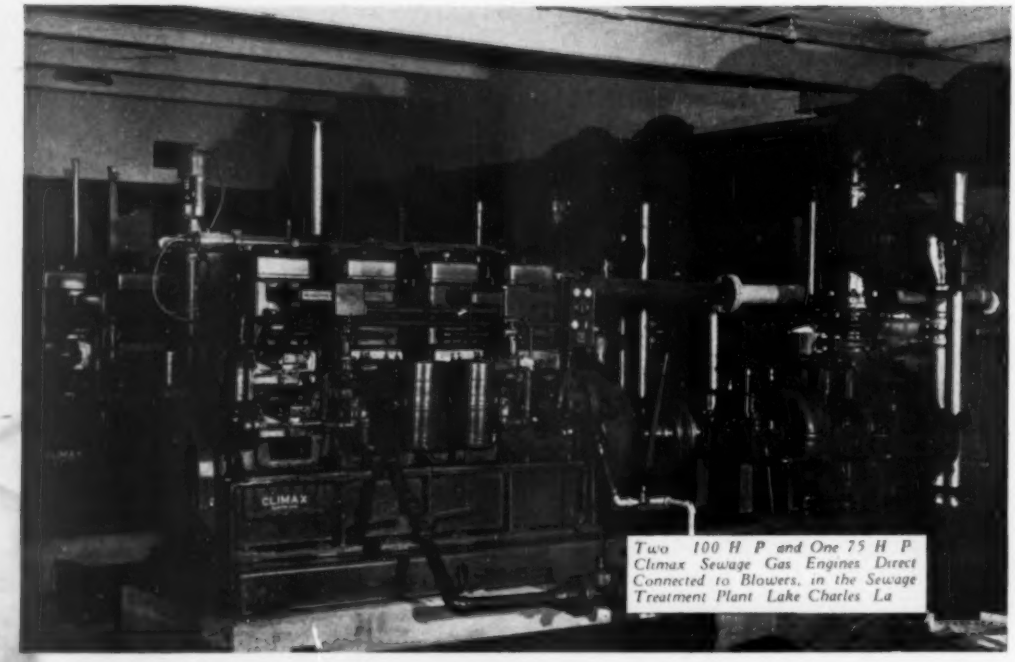


Mechanical aerators at Greenville are driven by the sturdy General Electric vertical motors shown here. These outdoor installations have withstood the abuse of all extremes of weather.



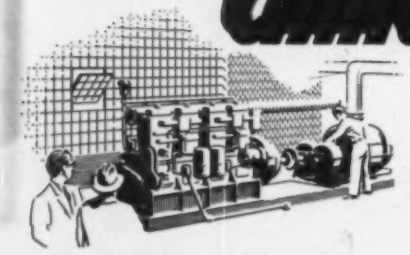
G-E vertical motors and G-E control for sedimentation tanks are mounted on pipes above high-water level. Like other G-E equipment at Greenville, they have given years of dependable service.

GE SEWAGE-PLANT



Two 100 H P and One 75 H P Climax Sewage Gas Engines Direct Connected to Blowers, in the Sewage Treatment Plant Lake Charles La

More and more climax Installations



For complete information and service records of Climax Engines for Water and Sewage Works write to Climax Engine and Pump Mfg. Co., 208 S. LaSalle Street, Chicago, Illinois.

are a result of proper design, precision manufacture, conservative ratings, and engineered applications.

Climax Engines are produced by a manufacturer with over 38 years of precision engine experience, furnishing engines for every type of service.

Climax Sewage Gas Engines are four cycle, multiple cylinder type, for continuous 24 hour duty, available in sizes from 40 to 250 H. P.

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INDIANAPOLIS, IND.

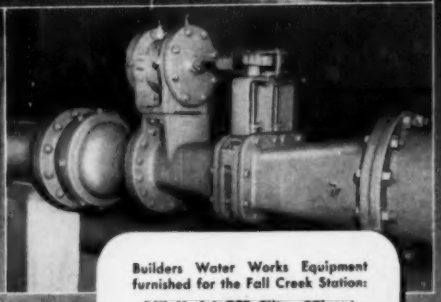
FALL CREEK STATION

Indianapolis Water Co.

(Addition completed in 1949)

LEWIS S. FINCH
Vice President and Chief Engineer
INDIANAPOLIS WATER CO.

MARSHALL P. CRABILL
Superintendent of Purification
INDIANAPOLIS WATER CO.



More people and more industries mean more water needed. Indianapolis Water Company faced this problem recently, and solved it by adding to its existing facilities. This enlargement doubles the capacity of the Fall Creek Station and increases by 16 MGD the available water supply of the city. The Water Company is now better able to furnish an abundant supply of pure water, particularly to the city's suburban districts.

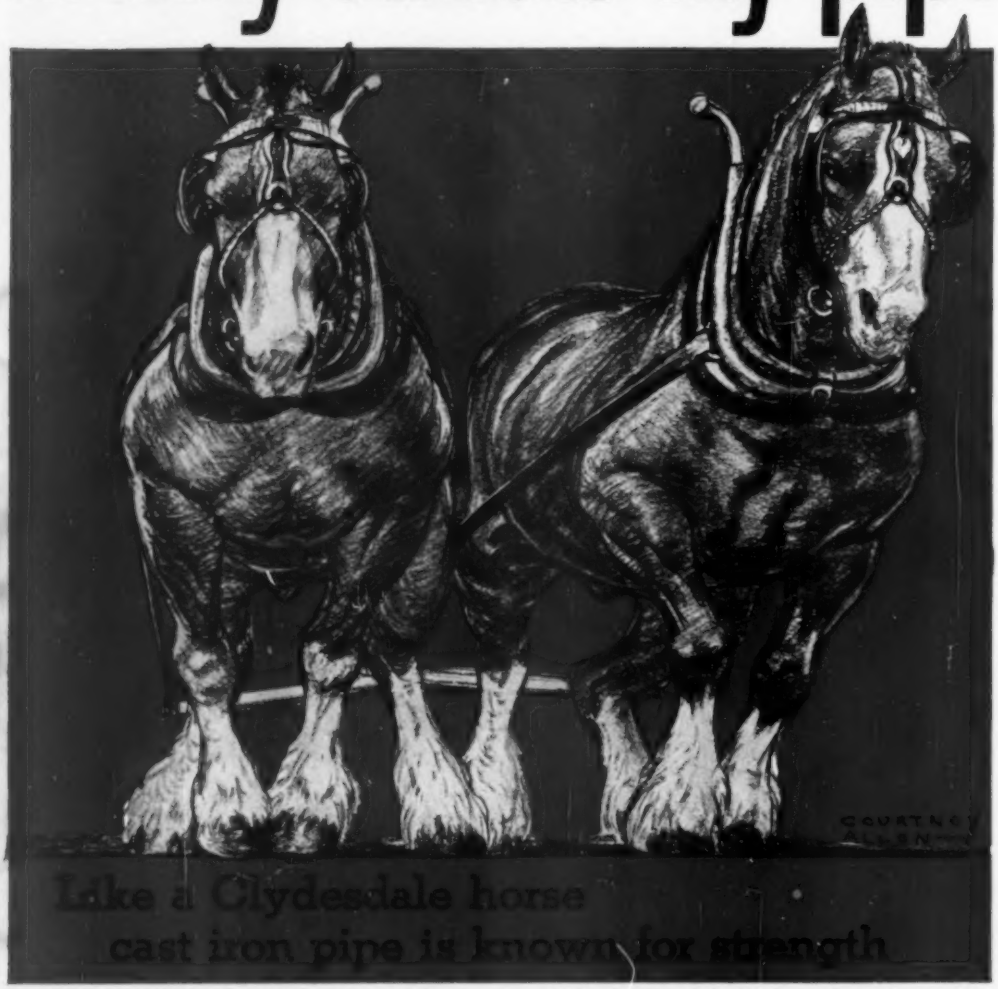
Builders Water Works Equipment, installed by A. V. Stackhouse, Contractors, Indianapolis, is employed throughout the new plant to meter and control the flows of raw water, filter effluent, wash water, and finished water. For Bulletins and complete information on Builders Equipment, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.

Builders Water Works Equipment furnished for the Fall Creek Station:

- 14" Model RCS Filter Effluent Rate Controllers (Lower right photo)
- Flo-Watch Totalizer-Recorders for Filter Effluent
- Flo-Watch Recorders for Filter Loss of Head
- 16" Venturi Tube with Flo-Watch for Wash Water
- 20" Venturi Tube with Type M Register - Indicator - Recorder for High Service
- 24" Venturi Tube with Type M Register - Indicator - Recorder for High Service
- 36" Venturi Tube with Flo-Watch Totalizer-Indicator-Recorder and Chronoflo Indicator for Raw Water.

BUILDERS PROVIDENCE
Instruments

in city streets lay pipe



Like a Clydesdale horse
cast iron pipe is known for strength

Known strength factors! Proved resistance to corrosion! These are your only safe and sure guides to long life and low maintenance expense of water, gas and sewer mains laid under costly modern pavements. The four strength factors that pipe must have to survive traffic shocks, heavy external loads, beam stresses and severe working pressures are listed on the page opposite. *No pipe that is deficient in any of these strength factors should ever be laid in paved streets of cities, towns and villages.* Cast iron water and gas mains, laid over a century ago, are serving in the streets of 30 or more cities in North America. These attested service records prove that cast iron pipe not only assures you of effective resistance to corrosion but all the strength factors of long life and economy, as well.

known for STRENGTH

No pipe that is deficient in any of the following strength factors should ever be laid under paved streets.

CRUSHING STRENGTH

The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

BEAM STRENGTH

When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

SHOCK STRENGTH

The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.

BURSTING STRENGTH

In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

CAST IRON PIPE SERVES FOR CENTURIES

PLANS WATERWORKS

25 YEARS AHEAD

Growing City's New Pumping Station uses Allis-Chalmers Pumps

THIS IS MOLINE . . . prosperous, energetic, fast growing industrial center in Western Illinois.

Keeping right up with its industrial and residential growth, Moline has planned its waterworks program years in advance. Their new pumping station, shown on this page, is designed to handle the city's water requirements for the *next 25 years*, based on an average 1 to 2% increase in water consumption per year.

That's looking ahead!

How about your city? How does your present pumping capacity compare with future needs?

If you are planning on expansion or modernization, do as Moline and other cities are doing — take advantage of Allis-Chalmers knowledge and facilities for handling municipal pumping problems. Check with your A-C sales representative today, or write for bulletin 52B6059G, listing complete line of Allis-Chalmers centrifugal pumps.

A-3217

ALLIS-CHALMERS, 1192A SO. 70 ST.
MILWAUKEE, WIS.

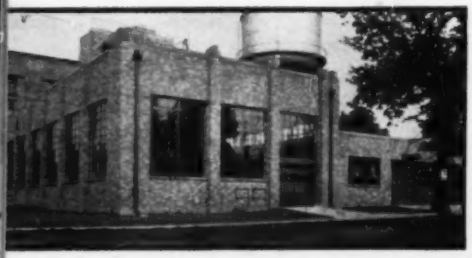
THIS WAS MOLINE 100 YEARS AGO . . .

These were the days when running water was a luxury. In the absence of cast-iron piping, all water flowed through hollowed out elm logs . . . and the water that *did* flow was raw and unfiltered.

BUT LOOK AT TODAY!

Water is plentiful, pure, and efficiently handled. This view shows Moline's new pumping station, using Allis-Chalmers high service pumps. Residents of Moline are proud of the men and firms responsible for the job — Beling Engineering Consultants; M. R. Bechstrom, architect; Priester Construction Company; H. Z. Zimmer, Equipment engineer.

ALLIS-



ALLIS-CHALMERS high lift pumps, shown here, take purified water from filtering basins and drive it through city's 100 miles of mains. Pump in the foreground is rated 4 M.G.D., 251 feet total head at 1800 rpm. The other three series pump units are each rated 6 M.G.D. against 266 feet total head at 1200 rpm. Gasoline engines supply standby power for two of these units in case of power failure.

CHALMERS

AC
ALLIS-CHALMERS

JOHNS-MANVILLE PRODUCTS

Johns-Manville

tax savings for the future

Three billion, two hundred and fifty million dollars*—that's what it will take to foot the bill for new water system construction so urgently needed by the American people during the next ten years!

For the thousands of communities that must carry a share of this additional investment, the vital need for water system expansion is most unwelcome at this time in the face of constantly rising costs.

This means that, wherever possible, water works officials will be called upon to keep an exceptionally close watch on expenditures . . . to see that the money laid out for new systems brings the greatest possible return to the taxpayer.

Since a sizable part of the cost of any water system involves the supply and distribution lines, an important question to be answered by these officials will be: "Which pipe will give the greatest return from this portion of our investment?"

Thousands of communities have already found the answer to this question in Transite Pressure Pipe.

A threefold warranty of economy is built into every length of Transite Pressure Pipe . . . the modern pipe developed by Johns-Manville through research and engineering to carry water more efficiently:

1. ***Long service life*** . . . because Transite Pipe is made of three inherently corrosion-resistant materials—asbestos, cement and silica—and is steam cured under pressure by a special Johns-Manville process which assures *maintained strength in service*. Carefully kept records of performance in highly corrosive soils prove that conditions which seriously weaken other pipe materials have little effect on Transite.

2. ***Low operating costs*** . . . because Transite Pipe has a smooth interior surface which provides a high water-carrying capacity (C=140). Moreover, because Transite cannot tuberculate, this high carrying capacity *remains* high through the years. Pumping costs, as a result, stay low. Delivery of a full volume of water at lowest operating cost is assured.

3. ***Maximum water economies*** . . . because Transite Pipe has tight, yet flexible joints that *stay* tight in service. These joints absorb vibration and soil stresses, cut down on costly underground water leakage. This is especially important today when water supplies in many localities must be conserved to the limit to meet constantly increasing water consumption.

In addition to these assurances of tax savings for the future, Transite Pressure Pipe offers many *immediate* economies, such as important savings in time and money during installation . . . further sound reasons why it will pay you and your community to specify Transite for the greatest return from your pipe investment.

*From THE WALL STREET JOURNAL, May 26, 1950

For complete information write Johns-Manville, Box 290, New York 16, N. Y.

TRANSITE PRESSURE PIPE

Transite is a registered Johns-Manville trade mark

Chemicals you live by

WHERE CHEMICALS ENTER YOUR PLANS

If you are working on water purification projects—or if you anticipate that you may soon be—may we take part in your plans where chemicals are needed?

DIAMOND ALKALI Research Department has accumulated a fund of knowledge covering the handling, shipping, piping and application of chemicals in the field of water purification. Whether your work deals with sanitary disposal or purely industrial waste disposal, we shall be glad to work with you.

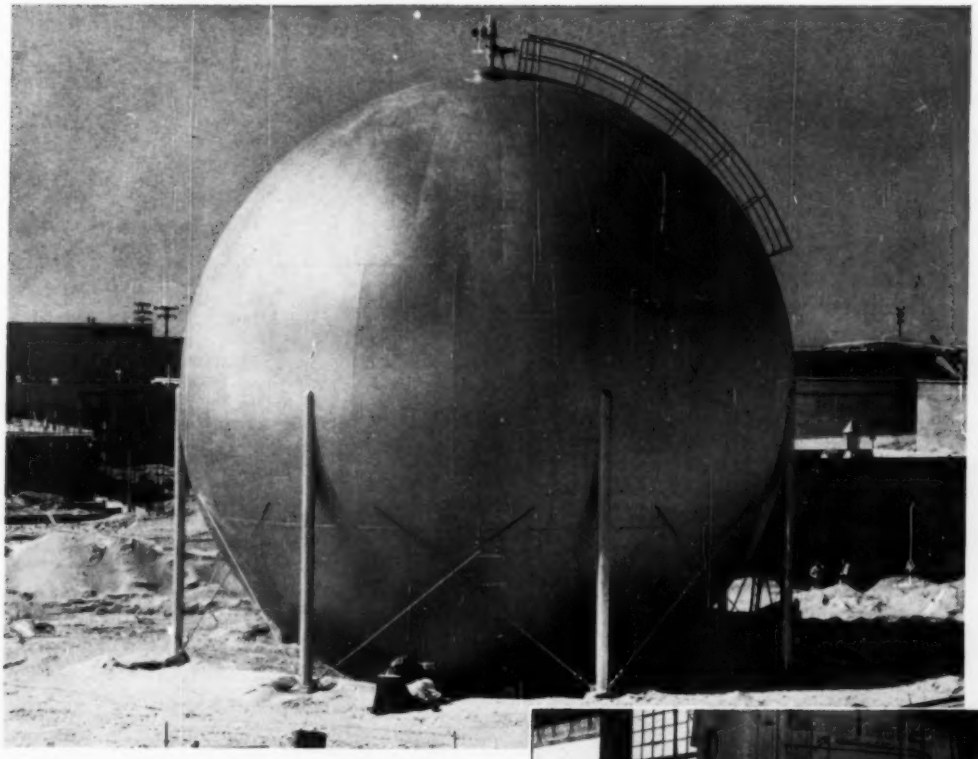
DIAMOND plants for Chlorine, Soda Ash, Alkali Specialties and Standard Silicates are excellently located across the country to assure good service. Get in touch with the nearest DIAMOND sales office regarding your present or probable needs.

Offices in Boston, New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis and Houston, and representatives in other principal cities.

DIAMOND CHEMICALS FOR WATER TREATMENT

DIAMOND ALKALI COMPANY • CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS



This view shows one of the plates for the 67-ft. 6-in. Hortonsphere which we built for the Hyperion Sewage Treatment Plant at Los Angeles being dished at our Salt Lake City plant.

Hortonsphere cuts fuel costs at Hyperion sewage plant

The new Hyperion sewage treatment plant in Los Angeles —will keep fuel costs low by storing and using digester gas instead of wasting it.

Sewage gas from the digesters will be one of the fuels used in drying sludge by heating. It will also be the basic fuel for nine 1000 h.p. dual-fuel engines.

When the digesters produce more gas than is used, the surplus will be pumped into the 67-ft. 6-in. Hortonsphere shown above. When the demand for gas exceeds the supply, the reserve in the Hortonsphere makes up the difference. Thus . . . in either the dryers or the engines . . . low-cost, by-product gas will be used instead of purchased fuel.

Although operating data is not yet available on the Hyperion plant, here's what other cities have saved by using digester gas stored in Hortonspheres: Cleveland, $6,500 in one year; Sheboygan, $26,063 in seven years; Duluth, $10,105 in one year.

You can't afford to ignore savings like these. Write our nearest office for information on how a Hortonsphere can help you lower costs by using digester gas.

The Hortonsphere is used for storing highly volatile liquids as well as gases. Examples of volatile products stored in Hortonspheres are butanes, the more volatile grades of natural gasoline, anhydrous ammonia, isoprene, and isobutylene.

CHICAGO BRIDGE & IRON COMPANY

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New York 6.....3390—165 Broadway Building
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San Francisco 4.....1583—200 Bush Street
Seattle 1.....1350 Henry Building
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Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

In Canada—Horton Steel Works, Limited, Fort Erie, Ont.

FOR WATER FLUORIDATION

depend on the uniform high purity of BLOCKSON Chemicals

BLOCKSON CHEMICALS

BLOCKSON sodium fluoride

FORMULA: NaF

STRENGTH: *98% NaF*
45% F
pH of 1% solution 6.5

SOLUBILITY: *60°F. 4 parts in 100 parts water*

Blockson Sodium Fluoride has a minimum purity of 98%. Fluorine content 45%. It is a white, free flowing crystalline product supplied in anhydrous powdered or crystalline form as listed below.

The dust-free crystal grade can be used as a bed through which water is percolated to form a saturated solution of Sodium Fluoride.

GRADES: **Powder, White:**
99% through 200 mesh
97% through 325 mesh
Density 65 pounds/cubic foot

Crystal, White:
100% through 20 mesh
2% through 60 mesh
Density 90 pounds/cubic foot

BLOCKSON sodium silicofluoride

FORMULA: Na_2SiF_6

STRENGTH: *98.5% Na_2SiF_6, 60% F*
pH of saturated solution 3.5

SOLUBILITY: *75°F. .75 parts in 100 parts water*

Blockson Sodium Silicofluoride is a white free flowing, odorless, anhydrous powder. Fluorine content 60%. When added to water, the alkalinity in the water dissociates the Sodium Silicofluoride to Sodium Fluoride.

Blockson Sodium Silicofluoride will be generally available for water fluoridation in ample quantities at low cost.

GRADES: **Standard, White:**
100% through 40 mesh
95% through 100 mesh
Density 72 pounds/cubic foot

BLOCKSON IS ONE OF THE LARGEST PRODUCERS OF THESE TWO PRODUCTS—ASSURING A DEPENDABLE SOURCE OF SUPPLY

Write for Samples

BLOCKSON CHEMICAL CO. • JOLIET, ILLINOIS

for replacements or new installations

Specify CLOW

CAST IRON PIPE, FITTINGS, VALVES and SPECIALS In Sewage Plant Construction

CLOW FLANGED END FLAP VALVE—Also comes with Bell or Spigot End. Flap valves are bronze mounted, are superior in meeting most field conditions, may be easily dismounted for repairs if found necessary at any time.

ASSURED LONG LIFE

CLOW BELL END SLUDGE SHOE—Also comes with Flanged End. Improved Sludge Shoes are extra strong, have maximum sludge opening, and the flare reduces entrance losses to a minimum.

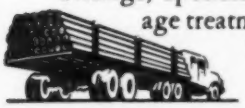
for a century or more

CLOW PRESSURE RELIEF VALVES—Bronzed mounted for smooth operation. Made with grated bottom to allow water only to enter tank. Can be made to any length desired.

CLOW FLANGE AND FLARE ELBOW—Are regularly furnished with flange faced and drilled to A.S.A. Class 125 Standard template. Bell and flare elbows can also be furnished.

CLOW SPECIAL CAST IRON PIPE AND FITTINGS

James B. Clow & Sons make a great many special cast iron fittings of irregular shapes in sizes up to 54", conforming to engineering details submitted by the purchaser and to meet the unusual requirements of pipe line specifications often presented in such types of construction as Filtration and Sewage Disposal Plants. Clow also manufactures Cast Iron Pipe in steel pipe sizes 3 through 10 inches (I.P.S. pipe) which has the same outside diameter as common steel pipe. I.P.S. pipe can be cut, threaded, and fabricated on the job with ordinary tools of the piping trade. Write for the Clow Catalog "Pipe Economy" which fully illustrates our line of Cast Iron Pipe, Fittings, Specials and Valves for use in sewage treatment plant construction. Ask Clow for price and delivery on your immediate needs.



CLOW CAST IRON PIPE FITTINGS

All types of Clow Cast Iron Pipe Fittings are offered in straight and reducing sizes for use with Bell and Spigot Joint, Mechanical Joint and Flanged Joint Cast Iron Pipe in sizes up to 24".

Illustrations below are Typical Fittings

CLOW BELL & BELL ONE EIGHTH BEND

CLOW MECHANICAL JOINT 90° ELBOW

CLOW 90° STANDARD FLANGED ELBOW

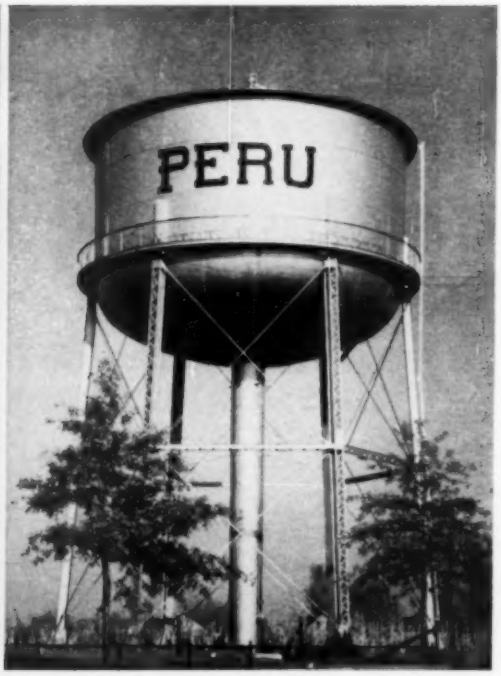
JAMES B. CLOW & SONS

201-299 North Talman Avenue

CAST IRON

Chicago 80, Illinois

National Cast Iron Pipe Division, Birmingham, Ala.; subsidiaries Eddy Valve Company, Waterford, N.Y.; Iowa Valve Co., Oskaloosa, Iowa



Above. 150,000-gallon tank protected on interior with NO-OX-ID "A Special"—on exterior with NO-OX-ID aluminum protective coating.

Left. 2,250,000-gallon steel tank—interior coated with NO-OX-ID "A Special." Exterior coated with NO-OX-ID Filler Rod C and Gloss Filler Black.

NO-OX-ID STOPS RUST

Immediately!

Stopping rust is not a long term proposition. At least it need not be if Dearborn NO-OX-ID rust preventives are used.

When the correct NO-OX-ID is applied to the metal surface of a water tank or tower, rust is stopped . . . immediately . . . right then and there . . . with one application. And from that time on NO-OX-ID provides long-lasting, economical protection . . . protection not possible with ordinary materials.

Investigate this modern way to protect against the costly threat of rust. A Dearborn sales engineer will assist you in selecting the correct NO-OX-IDs for your needs.

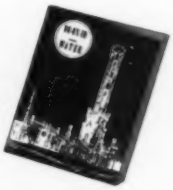
DEARBORN CHEMICAL COMPANY
310 S. Michigan Ave. • Chicago 4, Ill.

Dearborn
Reg. U. S. Pat. Off.
THE ORIGINAL RUST PREVENTIVE

NO-OX-ID
IRON – RUST

WRITE FOR "NO-OX-ID VERSUS WATER"

An interesting, illustrated booklet which tells the story of NO-OX-ID rust preventive protection in the water works field.



Dearborn Chemical Company
310 S. Michigan Ave., Dept. WS
Chicago 4, Illinois

Gentlemen:

Please send me a copy of Dearborn "NO-OX-ID versus WATER."

Name.....

Company.....

Address.....

City.....*State*.....

More **CRANE VALVES** are used than any other make

Crane "Pulsator" test of check valve endurance. By continuous sudden reversals of air pressure, valve discs are slammed open and shut at rates up to several hundred cycles per minute.

How Many Checks in a Good Check Valve?

You don't buy them that way, but that's what finally determines the value of check valves in your pipe lines. That's why Crane is so completely equipped for accurately pre-testing valve performance. For instance, "wearability" of check valves is tested by opening and closing the valves continuously on various fluids under conditions of actual service. Special equipment is used to accelerate these tests to equal many years' service in a short period. Countless tests like this—of materials, designs, and finished products—insure the superior performance values that mean lower piping costs for users of all Crane valves and fittings.

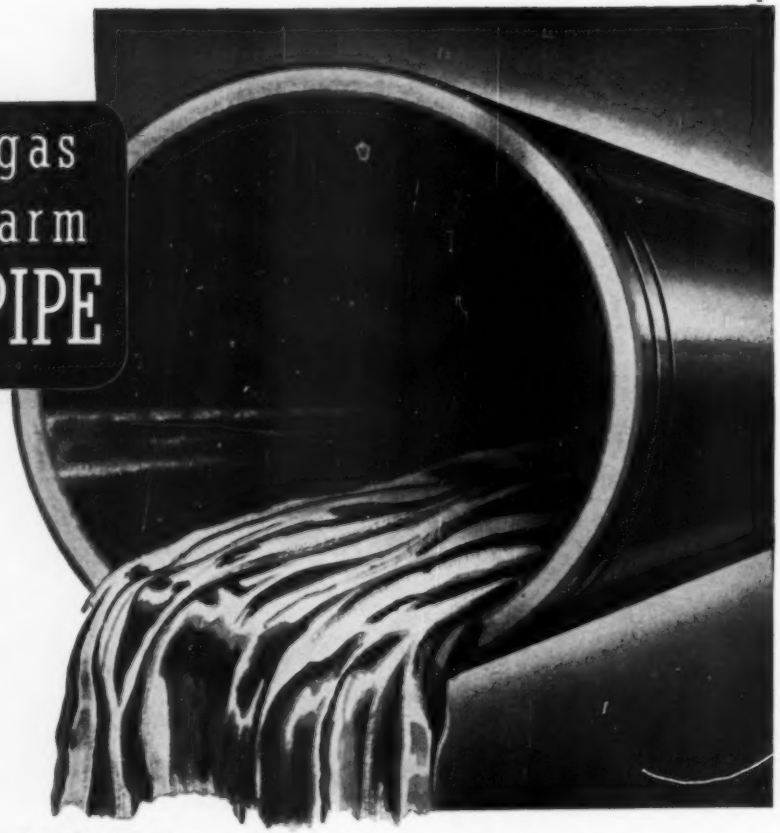
This new regrinding Brass Swing Check design typifies Crane's continuing product development for better valve performance, lower piping maintenance costs. For increased flow capacity . . . for fast, positive closure on backflow . . . for easier servicing without removing valve from line . . . get a demonstration of these 200 and 300-Pound Y-Pattern Check Valves. Phone your Crane Representative, or ask for literature.

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

sewer gas can't harm CLAY PIPE



The upper invert of Vitrified Clay Pipe is safe from the destructive, corroding acid fumes that rise from sewage. Maybe you've noticed how some sewers wear out *from the top down*. That's because the gases found in most sewer lines are often more harmful than the waste itself. But Vitrified Clay Pipe is completely safe from fumes and acids alike. It can't wear out, because it's chemically inert — top and bottom, inside and outside, through and through. Be *sure* by specifying Clay — the *only* pipe that never wears out.

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SPECIFY *Vitrified* CLAY PIPE

STANDARD-STRENGTH CLAY PIPE

EXTRA-STRENGTH CLAY PIPE

PERFORATED CLAY PIPE

C-150-2

For a quick Tap... and permanent Connection

RENSSELAER TAPPING SLEEVES *and* VALVES

The ideal combination for rapidly and easily making branch line connections to mains under pressure. Designed and built to resist line pressures and caulking strains.

FOR QUICK REPAIRS

Rensselaer Repair Sleeves make it easy to repair pipe lines. Similar to tapping sleeves, with exception of outlet connections.

FOR PIPE CROSSES

The Rensselaer Tapping Cross is extra heavy, with features found on regular tapping sleeves. Thousands have been used with uniformly perfect results.

Make the Job 100%
RENSSELAER

Rugged·Simple·Efficient

TAPPING Valves are our Standard Double Disc Gate Valves fitted with oversize seat rings to permit the use of full size cutters. Flange on one end is machined and drilled for perfect alignment with sleeves and crosses. Adaptor flange fits all standard tapping machines. SLEEVES are extra heavy, with lead gaskets to provide a watertight joint the *full length* of the sleeve. Centering rings provide a stop for caulking, and also save caulking materials. Let a Rensselaer Representative tell you further about this and other Rensselaer products.

LEADERSHIP FOR OVER 65 YEARS

RENSSELAER
VALVE COMPANY

Hydrants • Gate Valves • Square Bottom Valves
Check Valves • Tapping Sleeves and Valves • Air Release Valves

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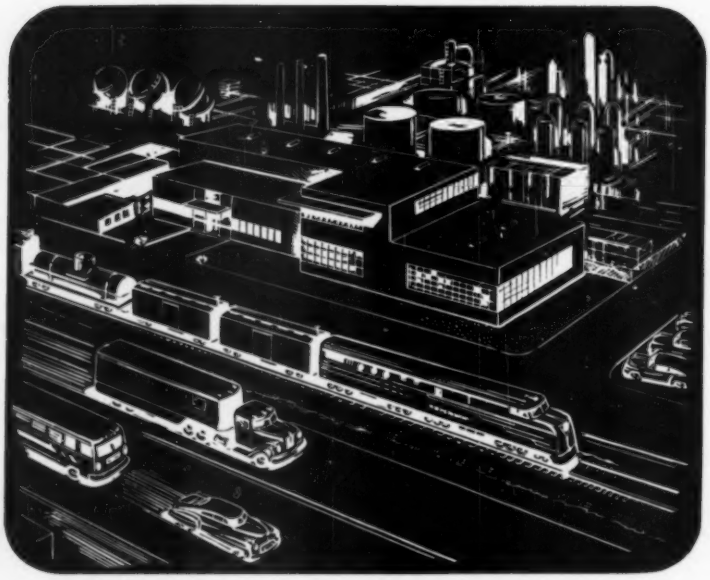
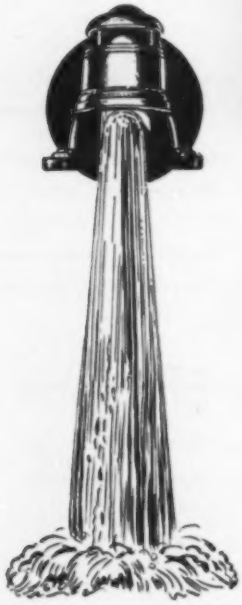
Atlanta, Bala-Cynwyd, Pa., Chicago, Denver, Haverhill, Mass., Kansas City, Los Angeles, Memphis, Oklahoma City, Pittsburgh, San Francisco, Seattle, Waco.



A new catalog on Layne Short Coupled Service Pumps with many diagrams showing applications, is now ready and will be sent upon request.



It Isn't A Question Of LEADERSHIP

Leadership in any field is a wonderful tribute to a fine product. But the Layne organization is anxious to have all prospective buyers consider the genuine quality of their Well Water Systems. Layne wants people to remember that their years and years of world-wide experience is being used to build better and better water systems; to find and remove even the smallest imperfection; to create, test and use new ideas that step up efficiency without adding cost.

Wherever you go, you will see Layne Well Water Systems serving cities, factories and all kinds of important industrial and chemical plants. In every case the buyer has carefully measured quality and efficiency against the investment and then decided that Layne and Layne alone could fulfill his needs.

A poor well is a bad investment. A good one saves many dollars each year. You can call in Layne and then contract for the complete job; survey, test drilling, drilling of the well, setting casing and sand screen, building and installing the pumps and final testing—all by well trained men of the Layne organization. No divided responsibility.

For further information, catalogs, etc., address

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LAYNE

WELL WATER SYSTEMS

VERTICAL *Turbine* PUMPS

Don't worry about pipe diameter!

DRESSER STYLE 82 SLEEVES MAKE TIGHT, PERMANENT REPAIRS ON ANY CLASS OF CIP

No need to let off-size pipe hold up your repair when every minute counts. The Dresser Style 82 Adjustable Repair Sleeve, with its interchangeable sections, has an adjustment range sufficient to provide a close fit on all classes of cast iron pipe—A through D.

Measuring tape supplied with sleeve indicates the proper combination of sections. Gaskets come already positioned; no trimming or fitting. One man with a wrench can make a permanent, bottle-tight repair in 10 minutes or less. Furnished for 4", 6" and 8" CIP. Also ideal as tapping sleeve.

Write today for literature and prices.

Dresser Style 82 Sleeve being installed over break. Note that nuts on all bolts are at the top—easy to tighten.

DRESSER
"ADJUSTABLE"
SLEEVES

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries) — In Texas: 1121 Rothwell St., Houston — In Canada: Dresser Mfg. Co., Ltd., 629 Adelaide St., W., Toronto — Sales Offices: New York, Philadelphia, Chicago, Houston, San Francisco.

MORE EFFECTIVE PRIMARY TREATMENT

WITH P.F.T. Pre-Aeration

P.F.T. Pre-aeration Equipment at inlet end of primary settling tank, at Stockton Calif., Sewage Treatment Plant. Clyde C. Kennedy, Consulting Engineer.

Pre-aeration and primary settling now can be effectively combined in the primary settling tank by the installation of P.F.T. Pre-aeration Equipment at the inlet end of rectangular tanks.

This equipment consists of standard porous diffuser plates in vertical cast iron holders, arranged for easy removal and servicing of plates. Air introduced to the raw sewage, through these plates, adds oxygen, provides agitation and mixing. This triple action provides three essentials:

1. Elimination of septicity.
2. Conditioning of solids for improved settling.
3. Increased removal of suspended solids and 5-day B.O.D.

A baffle separates the pre-aeration and sedimentation portion of the primary tank. A single sludge removal mechanism can be used to serve both sections of the tank—a further economy.

Installations of P.F.T. Pre-aeration Equipment are giving highly satisfactory performance. Write for further information and list of installations.

P.F.T. **PACIFIC FLUSH TANK CO.**

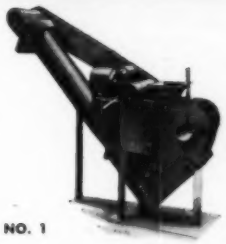
SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

4241 RAVENSWOOD AVENUE CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • DENVER • TORONTO

GRIT WASHING WITH THE JEFFREY "JIGRIT"

(Reg. U. S. Pat. Off.)



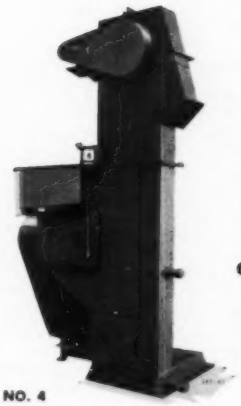
NO. 1

Scrubbing grit, freeing adhering organic solids and rejecting them with the overflow, classifying the products . . all these can be done efficiently with Jeffrey JIGRIT Washers (Patented), a type and size to meet your need exactly.

It has been shown by field studies that grit should be collected by one mechanism and washed in a separate unit. Jeffrey builds both . . collectors of the chain and scraper or chain and bucket type, or a combination of the two . . a series of Grit Washers as shown on this page.

Typical arrangements are available in drawing . . let us help you select the best means for collecting and removing grit from the channels.

NO. 9
FOR LARGE PLANTS



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Other Jeffrey Equipment for Sewage, Water and Industrial Waste Treatment:

Bar and Disc Type Screens
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Chains and Sprockets
Chemical Feeders
FLOCTROLS
Garbage Grinders
Scum Removers
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Send for Catalog No. 833

	❶	❹	❾
Capacity	20 cu.ft. per hour	120 cu. ft.	280 cu.ft.
Removes	80% Organics	90%	90%
Recovers	90% Inorganic grit	90%	90%
Feed Water	15 Gal. per min.	45-70 g.p.m.	100-140 g.p.m.

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ESTABLISHED 1877
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Complete Line of Material Handling, Processing and Mining Equipment

WHERE *Appearance* COMBINES WITH *Economy*

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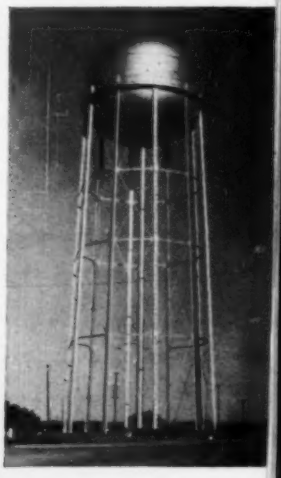
Double-Ellipsoidal Elevated Steel Tanks

Over a wide range of capacities up to a million gallons, the Pittsburgh-Des Moines Double-Ellipsoidal design offers low investment cost, excellent appearance and economical performance. It is one of the several P-DM Elevated Steel Tank types, meeting every water storage requirement.



Write for your free copy of our latest 24-page brochure, detailing many important aspects of modern water storage.

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SANTA CLARA, CAL.....625 Alviso Road

"City highly endorses Badger Meters and Testing Machines"

That's what the mayor of one Illinois city wrote to another, adding: "Operation of these meters has always been satisfactory and maintenance-cost very reasonable . . . in our meter shop, a Badger Testing Machine enables us to see the quality of our work, which was not possible before we bought the Testing Unit."

In over 5000 communities, waterworks men know that "It pays to BUY BADGER".

Every waterworks superintendent should have the NEW BADGER CHART No. 689 (Practical Plan for Meter Storage Rack). WRITE today for this chart . . . no charge.

You will find a Badger Meter size and type for every waterworks service. Shown here are Model SC-IOT (for warm climates), and Model A-IOT (for cold climates) . . . sizes ⅝" to 1¼" . . . other models in sizes up to 12". Write for complete information and prices.

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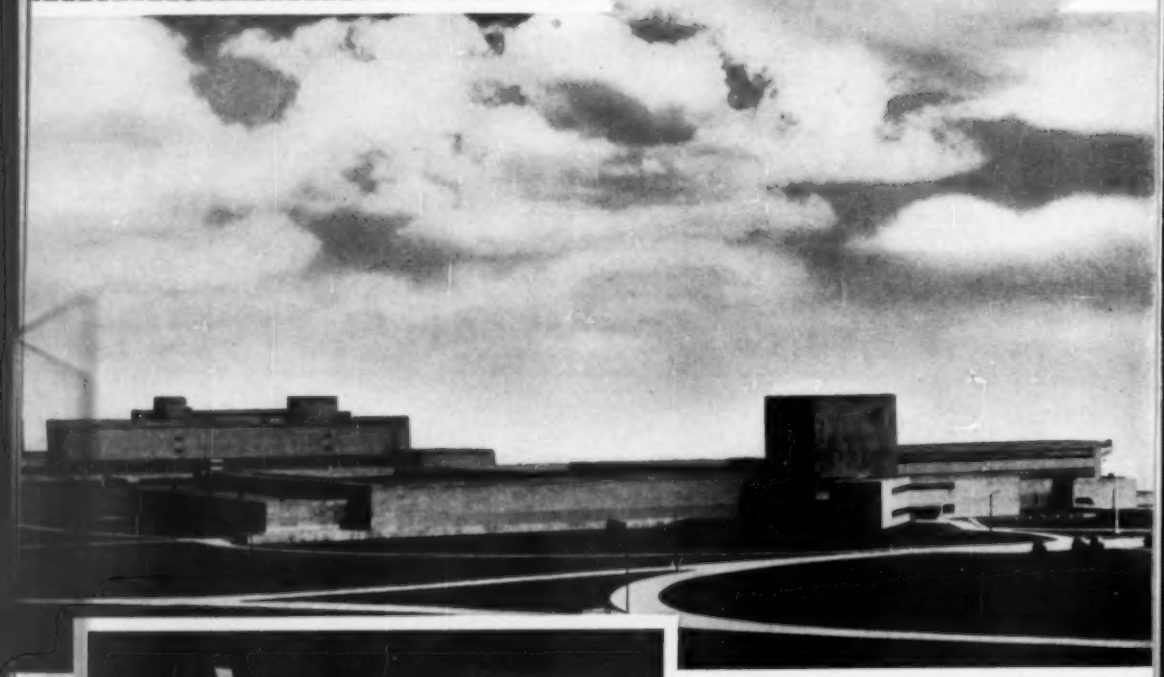
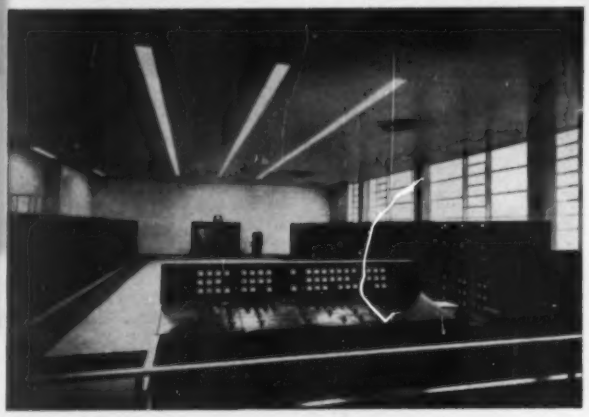
BADGER Water METERS

ACCURACY · LOW-COST MAINTENANCE · DURABILITY · SENSITIVENESS

YOU CAN BE **SURE**.. IF IT'S

Westinghouse





The Chicago South District Filtration Plant shown here is the largest in the world, serving more than a million and a half people. The plant has operated at an hourly peak of 546 mgd with only 70 of the 80 filters in service.

This mezzanine switchgear room in the lower left pumping station is an example of the way Westinghouse designs and manufactures electrical equipment for a co-ordinated, efficient system. (Right) High-voltage switchgear gives necessary protection on incoming lines, as well as feeders, and supplies power to large pump motors and station transformers. (Left) Low-voltage switchgear controls station auxiliaries such as priming pumps, crane motor feeder and valves. (Rear center) Network protectors and 120/208-volt distribution for building lighting and miscellaneous power. (Front center) Control desk with mimic bus, indicating instruments and circuit breaker switches centralizes control of plant equipment.

WESTINGHOUSE

Unit Responsibility

ASSURES WATER WORKS EFFICIENCY

For any water works, large or small, higher operating efficiency depends in part on your electrical manufacturer.

He should provide every type of electrical equipment . . . give you a co-ordinated engineering application . . . based on practical experience in vater works electrification.

These elements add up to unit responsibility and mean reduced operating costs for your plant. You get them all from Westinghouse:

Westinghouse makes a complete line of electrical equipment for water works. This includes "Unitized" metal-clad switchgear; packaged power centers, power transformers and unit substations; control and control centers; motors and gearmotors, as well as other electrical apparatus and supplies.

Westinghouse Consulting and Application Engineers are available to work with you. They will help you select and apply the right equipment to give you a co-ordinated, efficient electrical system.

Westinghouse brings you a background of long experience in applying electrical equipment to water works. The Chicago South District Filtration Plant, shown here, is but one more in a large list of outstanding installations where Westinghouse unit responsibility has been *proved* on the job.

For help on your water works electrification problems, call your nearest Westinghouse District Office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94818

This control center on the third floor of the Chemical Building groups into one unit all the combination linestarters and motor control for fan motors, agitator drives and other auxiliary equipment in this plant area.

These two 300-kva, 3-phase, 60-cycle, 2300/120-208-volt, liquid-filled distribution transformers are located in the west pump room and supply power for the building lights and equipment in the Filtration Plant.

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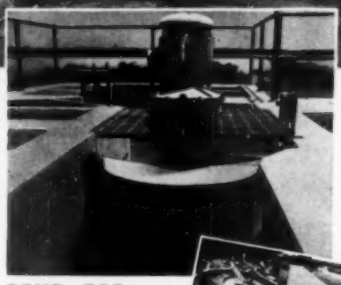

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WATER & SEWAGE WORKS

Vol. 97. No. 12 DECEMBER. 1950

A Gillette Publication

FEDERATION OF SEWAGE AND INDUSTRIAL WASTES ASSOCIATIONS

Washington, D.C. Meeting Adopts New Name

Presidents

Incoming
R. E. Fuhrman
Supt.
Sew. Treat.
Washington, D.C.

Retiring
A. H. Niles
Supt.
Sew. Treat.
Toledo, Ohio

THE twenty-third annual meeting of the Federation of Sewage Works Associations was held in Washington, D.C., at the Statler Hotel on Oct. 9-12, 1950. Hosts for the meeting were the Md.-Del. Water and Sewerage Assn. and the Federal Sewage Research Assn.

This was the last time that the Federation will meet under that name, for, in consonance with the change of the name of the Journal last January, the Board of Directors voted to change the name of the organization to "Federation of Sewage and Industrial Wastes Associations."

Paid registration at the annual meeting this year was somewhat disappointing and generally below expectations. As of Wednesday night, the paid registration had reached only 778 persons, including the ladies. Unpaid registration for the Thursday morning sessions brought the total up to 895, compared to the 1949 total of 821 (that number, too, included a couple of dozen or more of unpaid registrations for the final sessions). If these two conventions are to be considered as typical then it would appear that in counting the registration totals as a measure of the success of the meeting, such totals should be reported as paid and unpaid final session registrants.

Except for the somewhat disappointing attendance figures, the meeting was a great success, the technical sessions were particularly well attended and the manufacturers exhibits received considerable attention, and some drew outright praise. As was the case in 1949, the industrial waste session on Thursday morning outdrew the operators session but the latter was lively, informative and considered quite successful.

Exec. Secy.
W. H. Wisely
F.S.W.A. Secy.
Champaign, Ill.

Treasurer
W. W. DeBevard
City Engineer
Chicago, Ill.
(Also Hon. Memb.)

Newspaper coverage of the convention was good and the Interstate Commission of the Potomac River basin timed its publication of an open letter on the subject of pollution of the Potomac to coincide with the Federation meeting. It was an effective bit of public relations.

New Federation Officers

Following the Board of Directors meeting on October 8, the Election Committee of the Federation, consisting of all of the directors representing Member Associations, met and elected the following slate of officers for the ensuing year.

C. E. Keefer
Dep. Engr.
Bur. of Sew.
Baltimore, Md.
(Gascoigne)

M. M. Cohn
San. Engr.
Dep. Pub. Wks.
Schenectady, N.Y.
(Emerson)

R. F. W
San. Engr
Atlantic Ref
Philadelphia
(Industri

J. R. Szymanski
Supt.
Sew. Treat.
New Britain, Conn.

WATER AND SEWAGE WORKS

President
Ralph E. Fuhrman
Superintendent
Sewage Treatment Works
Washington, D.C.

Vice President
Earnest Boyce
Head and Professor
School of Civ. Engr.
University of Michigan
Ann Arbor, Mich.

Treasurer
W. W. DeBerard
City Engineer
Dept. of Public Works
Chicago, Ill.

Exec.-Secy. Editor
W. H. Wisley
Champaign, Ill.

Vice Pres.
Earnest Boyce
Head
Civ. Eng. Dept.
Univ. of Mich.
Ann Arbor, Mich.

Dir. at Large
E. S. Chase
Partner
Metcalf & Eddy
Cons. Engrs.
Boston, Mass.

Honors and Awards

At the annual banquet, the following honors and awards were presented:

HONORARY MEMBERSHIP to *Wilford Willis DeBerard*, City Engineer, Chicago, Ill., for his longtime service to the Federation in various capacities including membership of the Board of Control since 1936, member of the Publication Committee from 1936 to 1939, and Treasurer of the Federation since 1941.

THE HARRISON PRESCOTT EDDY MEDAL, for an Outstanding Contribution in Research, to *Daniel A. Okun*, for his paper "A System of Bioprecipitation of Organic Matter from Sewage" which appeared in *Sewage Works Journal* in September, 1949.

THE GEORGE BRADLEY GASCOIGNE MEDAL, for an Outstanding Contribution in Plant Operation, to *Clarence Edward Keefer*, Deputy Sewerage Engineer, Bureau of Sewers, Baltimore, Md., for his paper on "The Operation of the Back River Sewage Works, Baltimore, Md.," which appeared in *Sewage Works Journal* in May, 1949.

THE CHARLES ALVIN EMERSON MEDAL, for Meritorious Service to the Federation, to *Morris M. Cohn*, Sanitary Engineer, Schenectady, N.Y. Mr. Cohn has given many years of outstanding and praiseworthy service to the Federation as a member of the Board of Control for 12 years, as Vice Chairman of the Federation in 1935-36, as organizer, and first and only chairman of the Sewage Works Practice Committee, as well as service on the executive, legislative, and publicity and attendance committees.

THE INDUSTRIAL WASTES MEDAL, for an Outstanding Contribution in Industrial Wastes Control, to *Roy F. Weston*, *Robert G. Merman* and *Joseph DeMann*, of the Waste Laboratories of the Atlantic Refining Co., Philadelphia, Pa. for their paper, "The Industrial Plant Waste Disposal Survey," which appeared in *Sewage Works Journal* in March, 1949.

THE ARTHUR SIDNEY BEDELL AWARDS, for Meritorious Service to FSWA Member Associations, were presented as follows: Leland Bradney (Dakota), John Chester Brigham (New York), Herbert B. Foote (Montana), L. L. Hedgepeth (Virginia), Theodore J. Lafreniere (Canada), Robert G. McCall (West Virginia), Edward Alexander Reinke (California), Frank S. Taylor (Oklahoma), LeRoy Winfield VanKleeck (New England), William Hugh Weir (Georgia), Leonard Oliver William, Jr. (Rocky Mountain), and Abel Wolman (Maryland-Delaware).

THE WILLIAM D. HATFIELD AWARDS, for Outstanding Operation Reports, were made as follows: For Cities over 100,000 population to *John W. Johnson*, Superintendent (now General Manager) of the Buffalo Sewer Authority, Buffalo, N.Y.; for cities between 10,000 and 100,000 to *Walter A. Sperry*, Superintendent, Aurora Sanitary District, Aurora, Ill.; for populations of less than 10,000 to *William L. Edwards*, Superintendent of Sewage Treatment, Gowanda State Hospital, Gowanda, N.Y.; in the 10,000 to 100,000 class a "Previous Winner's Award" was also made to *John R. Szymanski*, Superintendent, Sewage Treatment Works, New Britain, Conn.

Board Actions

In addition to voting to amend the Constitution in order to change the name of the Federation, the Board of Control received a number of reports of committees, and at its second meeting of the session adopted a budget for the ensuing year.

Some of the committee reports are of particular interest to the membership at large as well as others. Secretary Wisely reported that the rapid growth in membership in the Federation had been interrupted as a result of the increase in Active Member dues from $3 to $5 annually. It is interesting to note, however, that the aggregate Active and Corporate membership as of Sept. 30 was 5043 or a loss of only 1.5 per cent (in 1942 when the dues went up from $1.50 to $3.00 the loss was 13.5 per cent). The actual overall net loss was 76 and it was noted that the loss in the two British Associations was 77; other gains and losses were about even, with sixteen of the associations showing gains.

Affiliation of the South Carolina Water and Sewage Works Assn. with the Federation brings the total number of member associations to 36 (including Argentina which has been inactive for a number of years).

The 1950 membership contest was won by the Iowa Sewage Works Assn. for numerical increase with a recorded gain of 37 members for the year end-

W. J. Orchard
Gen. Mgr.
Wallace & Tiernan
Newark, N.J.
(Conv. Mgmt.)

F. W. Gilcreas
Asst. Dir. Labs.
St. H'lth Dept.
Albany, N.Y.
(Program)

Committee Chairmen
L. H. Enslow
Editor
Wat. & Sew. Wks
New York, N.Y.
(Publicity)

M. J. Blew
Chief
Wat. & Sew. Sect.
Washington, D.C.
(Hotel)

W. M. Bingley
San. Engr.
Md. Dept. H'lth
Baltimore, Md.
(Registration)

ing Sept. 30. Runner-up was New England with 25, followed by Michigan with 23 and New Jersey with 17. The membership contest for percentage increase was won by Louisiana with a 50 per cent gain. Runner-up was Iowa with 32 per cent, followed by Switzerland with 15 per cent and New Jersey with 12 per cent. Louisiana's 50 per cent gain was accomplished with an actual increase of one member and as a result of this fact the Board decided that in the future any association which had won a percentage increase must have a numerical increase of at least five members to be eligible for the percentage gain contest within a period of the succeeding five years.

In spite of the fact that advertising revenue for the Journal had not come up to the budgeted figure of the previous year, the Federation had been able to operate in the black by carefully scheduling the production of the Journal within the funds available. It was confidently predicted that by the end of the year the net worth of the organization would have increased, above the $44,298 of last year.

The change in Journal publication from bi-monthly to monthly issue was successfully accomplished and considerable additional editorial space was available, with the result that much of the backlog of accumulated material was used up. At the end of nine months, more space had been available for editorial material than in the previous year, and the distribution of material showed more practically in all categories than in the previous year. Secretary Wisely reported that there is a good volume of industrial waste papers now on hand but a shortage of material on practical sewage works operation.

No new manuals of practice were issued during the year but two, one on Chlorine and one of air diffusion are nearing final production. The chlorination manual has been delayed in order to include in it material on industrial waste, and the Sewage Works Practice Committee recommended that in view of the Federation's interest in the development of standards of practice on all phases of industrial waste treatment problems, every future manual of practice should include a section on industrial waste.

The Twenty-Year Index to Sewage Works Journal compiled by Messrs. Wisely and Symons was completed and published. It went on sale on Sept. 22 and at the time of the convention two weeks later more than 300 orders had been received.

Water Policy
Abel Wolman
Prof. San. Engr.
Johns Hopkins
Baltimore, Md.

Pollution
Mark Hollis
Asst. Surg. Gen.
USPHS
Washington, D.C.

The Board of Control passed a resolution calling on Congress and all governmental persons and agencies interested in or concerned with the problem of pollution abatement to consider fully and take the necessary steps to insure that pollution abatement and necessary waste treatment be expedited during the period of emergency because of the importance of this program to the national interest.

The Board adopted a budget calling for an expenditure in 1951 of $77,000 with $40,000 of this amount being budgeted for publication of The Journal.

Choice of meeting place for 1953 was set for Miami, Fla., the 1951 meeting will be held in St. Paul and the 1952 25th anniversary meeting in New York City.

Social Events

In accordance with annual custom, Monday evening was devoted to an informal reception and mixer to provide an opportunity to greet officers of the Federation and this was followed by an evening of entertainment by variety acts.

On Tuesday evening, there was no scheduled entertainment and many of the conventioneers made good use of the available time to seek out unusual eating places and to see a bit of the Capital by night.

Wednesday evening as usual saw the annual dinner, with presentation of awards, followed by an evening of dancing. These events were designed for the enjoyment of the ladies as well as the men, and in addition the ladies attending the convention had a Get-Acquainted Tea, a Tour of Arlington, Alexandria, and Mt. Vernon, and a Tour of Major Public Buildings.

Inspection Trip

Two features were included on the Inspection Trip. The first was a guided tour of the District of Columbia Sewage Treatment Plant at Blue Plains. This plant covering 22 acres has a sewage flow of 175 mgd. and serves a population of 975,000. The cost excluding land and including present additions was $4,900,000. In brief the plant consists of eight grit channels, 3-minute pre-aeration for grease removal, sixteen sedimentation tanks (106 ft. dia.), twelve sludge digestion tanks, (84 ft. dia. with 1.75 cu. ft. per cap. capacity), sludge elutriation, and sludge dewatering by vacuum filters. Gas is used to generate electric power for the plant. This guided tour was under the direction of the superintendent, Ralph E. Fuhrman.

The second part of the inspection trip was a visit to the Sewage Treatment Works of the Pentagon Building. This plant designed by Charles R. Velzy is under the supervision of W. R. Torrey, and serves not only the Pentagon Building with some 30,000 daytime employees, but also Fort Meyer and Residence Halls, and certain other buildings. The plant consists of primary sedimentation with two stage secondary trickling filter treatment with recirculation in both stages. Sludge is digested and the gas is used to heat the digesters and buildings. Dried sludge is used for soil conditioner around the Pentagon property. The plant has been in operation since 1942. Final effluent goes to the Boundary Channel.

Luncheon Speaker

At the annual Federation Luncheon, the guest speaker was Dr. Abel Wolman, Professor of Sanitary

A. P. Rudder
Dist. Mgr.
W & T
Washington, D.C.
(Finance)

J. W. Engle
Chief
Off. Ch. Engrs.
Washington, D.C.
(Entertainment)

Committee Chairmen

M. H. Coblenz
San. Engr.
USPHS
Washington, D.C.
(Inspection)

W. H. Cary
Director
Pub. Wtrs. Engr.
Washington, D.C.
(Host)

Engineering, The Johns Hopkins University. Dr. Wolman spoke on "Reflections on National Water Policy" and said that his reflections were not merely of academic interest. When he had finished it was obvious that the audience agreed with that opinion.

In opening the talk, Dr. Wolman described in brief order a dramatic experiment in engineering which showed what it is possible to do with a large group of technical persons, once the significance of the project is made known. For the benefit of the audience, most of which was unfamiliar with the Engineering Joint Council, Dr. Wolman reviewed the history of the E.J.C. Report and the make up of the committee which prepared it. One of the outstanding accomplishments of the committee was its completion of the large job of reviewing the water situation in the U.S. in the short space of six months.

The E.J.C. Panel created a coordinating committee and eleven primary task committees which included some 75 engineers, but no representatives of any federal agencies. It was estimated that the value of the services rendered was worth $110,000 which the President's Committee on Water Policy received at no cost.

It is interesting to note that the men chosen to aid in the preparation of the report were of varying opinions and varying backgrounds, but there was practically unanimous agreement insofar as major premises of the report were concerned.

The report which is rather voluminous, but not merely wordy, deals with an industry that on the federal level is worth billions of dollars, and for the next five years alone the program for that industry calls for a needed expenditure of $5 billion.

Two axioms were restated in the report on several occasions, namely, that public moneys for any use be limited to their availability, and secondly that there are many public needs which can rightly compete for federal money. In this later respect it is obvious that some one has to make a choice or selection and the hard job is to determine and evaluate the basis of selection. Selection can be made on the basis of quantitative value or qualitative value. Now, it is possible to determine the quantitative value and to discover which projects are good, necessary, and desirable. But it is not easy to determine the qualitative values, because no one knows how to measure them. Therefore it was necessary to say that they should be put in separate categories to make the qualitative values apparent.

The E.J.C. Report pointed out that federal bureaus should definitely not appraise the value of any project if they had any interest in it. Further, in the opinion of this panel of engineers, no board of appraisal which the government might set up should have any interest in design, construction or in the fiscal policies involved. Neither should such a board of appraisal be composed only of engineers.

Dr. Wolman pointed out that all federal agencies are creatures of congress, and that no single political party can accuse the other that it alone is bad. All political parties and politicians in Congress have wanted to dip into the pork barrel in every instance as regards every federal water policy for the past 75 years. The blame should be put squarely on Congress and on individuals which have driven agencies into the abuse of criteria as to value of water projects.

In the report, the two task committees concerned with water and fish and wild life, both recommended that all efforts toward implementing water policy should be handled at the lowest local level which can do so. The report also pointed out that there is no formula in national use that has validity or that can be defined for determining what projects are or should be necessary. One field that should also have a national policy is that of recreation, a field that up to now has had neither policy nor direction.

Dr. Wolman concluded his talk with the recommendation that the Federation of Sewage and Industrial Wastes Assns. should, in the coming year, participate in evaluating the benefits derived from past, present, and future stream pollution abatement projects.

Wat. & Sew. Wks. Manufacturers Assn.

President	Vice Pres.	V.P. Elect	Act. Secy. Mgr.
R. F. Hayes	*R. F. Orth*	*E. M. Jones*	*D. E. Dimmers*
Vice Pres. "Hydraitic" New York, N.Y.	*Vice Pres. "Transite" New York, N.Y.*	*Vice Pres. Simplex Valve Philadelphia, Pa.*	*Act. Secy. WSWMA New York, N.Y.*

Welcome to Washington

Following the opening of the 23rd annual meeting of the Federation by President A. H. Niles, Supt. Sewage Works, Toledo, Ohio, the Federation was officially welcomed to the host city of Washington, D.C. by Brigadier General Gordon R. Young, Corps of Engineers, U.S.A.; Engineer Commissioner of the District of Columbia. General Young referred to the problem of pollution abatement, not only for the city, and the District of Columbia but also for the entire metropolitan area and the Potamac River.

Poilution Abatement in the U.S.

"Problems of Water Pollution Abatement in the United States," by Mark D. Hollis, Assistant Surgeon General; Associate Chief, Bureau of State Services, U.S. Public Health Service, Washington, D.C.

Mr. Hollis summarized the present status of the water pollution problem in the United States, and discussed some of the responsibilities of the states and of the Federation to prevent pollution and to provide for the best use of the country's streams. In the course of the talk Mr. Hollis reviewed the history of the appropriations under P.L. 845 and then went on to comment that there are some 20,000 sources of pollution in the country. These are about equally divided between domestic and industrial wastes. This includes some 6000 cities with a population of 30,000,000, which have sewage treatment and 4000 cities with a population of 40,000,000, which do not have sewage treatment. It is known that some 2000 industries out of 10,000 have a population equivalent of 40,000,000 but the pollution load of the other 8000 is as yet unknown.

Since 1905, more than $9 billion have been spent on capital outlay and $1 billion in maintenance and repair. The expenditure in 1949 was at least $277,000,000 and for the future it is estimated that in the next ten years alone, the expenditure for sewage works will be $4,500,000,000.

Mr. Hollis spoke on the cooperation of the Public Health Service and the state and interstate agencies and pointed out that 25 states have passed laws since 1940, and 36 states have two or more agencies but 20 do not have comprehensive control. Mr. Hollis also spoke of the need for

uniform legislation and said that he believed it would help reduce pollution.

On the matter of intergovernmental cooperation, Mr. Hollis pointed out that the Public Health Service in cooperation with the states had subdivided the country into 260 watersheds, about half of which are interstate in nature. This fact makes it evident that interstate cooperation is not only highly desirable but a necessity. There are ten interstate compacts at the present time.

As to what the Federation can do, Mr. Hollis suggested that its members both individually and collectively, through its member associations and the Exec. Secretary's office should strive to become a greater force in the democratic processes that operate toward the solution of these problems of stream pollution abatement. This means that each local association should learn of the needs in its own area and should make those needs known to federal, state, and local governments.

Mr. Hollis closed his talk with the warning that no one should allow stream pollution to reduce industrial capacity in its effort to serve the national defense needs.

Measurement of Sewage Flows

"MEASUREMENT OF SEWAGE FLOWS" by Walter H. Brown, Sales Engineer, Builders-Providence, Inc., Providence, R.I.

Mr. Brown stated that "complete and accurate metering is essential for maximum operating efficiency and minimum cost of operation of any sewage plant" and in his paper he outlined the chief points where flow measurement is desirable in sewage treatment plants. These points of measuring include influent, primary sludge, primary tank effluent, returned sludge, excess activated sludge, digested sludge, air to aeration tanks, gas from digesters, elutriation water and sludge, and filter cake.

In developing the discussion around these points of metering, Mr. Brown named the various types of meters that could be used for each service. For example in reference to raw sewage metering he mentioned, the Venturi Meter, the Kennison Nozzle, and the Parshall Flume and he pointed out the advantages of each, both from the standpoint of cost and operation.

Mr. Brown illustrated some of his discussion with comments on actual installations, particularly at Cranston, R.I. where he was formerly Superintendent.

In closing his talk, Mr. Brown drew several conclusions, including these: Complete metering is essential to efficient plant operation; no operator can do justice to his plant processes unless he knows the conditions under which it is being operated; it is essential to know, and not to guess, the performance of each main unit in any large scale reduction process as complete as sewage treatment; and the selection of the types of meters to measure sewage plant operation must be made after carefully taking into consideration all of the conditions involved.

The paper was discussed briefly by A. A. KALINSKE, Director of Development, Infilco, Inc., Chicago, Ill.

W. H. Brown
Sales Engr.
Builders-Providence
Providence, R.I.

A. A. Kalinske
Dir. of Dev.
Infilco, Inc.
Chicago, Ill.

Frank C. Roe
Dev. Engr.
Carborundum
Perth Amboy, N.J.

Uhl T. Mann
Supt.
Ley Creek Plant
Syracuse, N.Y.

Programmers

Tampa, Fla. Sewage

"SEWAGE DISPOSAL AT TAMPA, FLA.," by Paul E. Langdon, Greeley and Hansen, Consulting Engineers, Chicago, Ill.

Mr. Langdon outlined the problem brought on at Tampa by the rapid growth of the city and the surrounding suburban area. While there had been various studies since 1927 little had been done to relieve the pollution load in the river and the D.O. therein was practically non-existent, while the Coli Index was quite high.

Mr. Langdon outlined the proposed plan of attack pointing out that some $25,000,000 would be spent on the metropolitan area. Sixty-eight miles of sewers and a treatment plant consisting of primary sedimentation, chlorination, and sludge digestion will be constructed.

The project will be constructed and operated from funds obtained by sewer service charges. Annual costs will be: Operation and maintenance $306,000; Debt service $657,625; and sewer maintenance $146,675 or a total of $1,110,000. To obtain these funds the sewer service charge will be 100 per cent of the water bill, plus a sewer improvement fund charge of 35 per cent of the water bill, with a 10 per cent discount for prompt payment. A connection charge of $15 will also be made. Construction was started in 1950 and there is now under contract $2,000,000 worth of work. The first phase of the entire project calls for an expenditure of $13,000,000.

In discussing this paper, DAVID B. LEE, Director, Bureau of Sanitary Engineering Florida State Board of Health, Jacksonville, Fla., complemented the engineers and the city for the splendid work started at Tampa. He pointed out that as is the case in many Florida cities, the big problem at Tampa was the fringe areas, where the septic tank problem is more than just a term. Mr. Lee also called attention to the fact that in the case of Tampa, the State Health Dept. agreed to primary treatment plus chlorination, providing the plant was located so that secondary treatment could be added if necessary. He also noted that the sewers are adequate for the year 2000, and there will be no more piecemeal construction of sewers.

Aeration and Flocculation

"PRE-AERATION AND AIR FLOCCULATION" by Frank C. Roe, Development Engineer, The Carborundum Co., Perth Amboy, N.J.

Mr. Roe said that a careful study of the subject revealed that probably no other single step of modern sewage treatment practice had received so little analysis and reporting on performance. It was this void of positive information which led to the development of the survey reported in the paper. Out of 91 plants using pre-aeration in 18 of the 33 states which reported, 38 plants gave answers to a questionnaire.

Before reporting the results of the survey, Mr. Roe pointed out that the definition of Pre-aeration as given in the "Glossary of Water and Sewage Control Engineering Terms" says that the process comprises a preparatory treatment which, by use of aeration, removes gases, adds oxygen, floats grease, and aids coagulation.

The variability of period or intensity of pre-aeration as practiced in the U.S. certainly coincides with the broadness of the definition. It is not clear where physical flocculation

ceases and complete biological flocculation and oxidation begins.

Under the heading of theory of pre-aeration, Mr. Roe said that so many complex relationships existed that it seemed reasonable to simply enumerate the chemical and physical changes which occur during pre-aeration, and he proceeded to enumerate four changes including: Reversing the falling oxidation-reduction potential, enhancing coagulation and dewatering of emulsified grease, sweeping out entrained H_2S and sweeping out entrained CO_2.

Mr. Roe then proceeded to discuss current practice as exemplified by such results as odor control, grease separation, grit separation, removal of suspended solids, and reduction of B.O.D.

Also included in the paper was a discussion of methods of pre-aeration, aeration tank design and equipment, and air and diffuser requirements.

Mr. Roe listed these conclusions from his study of the survey results (1) Pre-aeration establishes a positive O.R.P. and prevents septicity in relatively short periods of 5 to 15 minutes (2) Odor control is also accomplished in the same short period of time; (3) Efficiency of grease separation is generally increased to 60 per cent or better in 20 or preferrably 30 minutes; (4) Mechanical and biological flocculation of solids commences in short periods of aeration and continues steadily, with improved results, as the aeration period is increased; and (5) Pre-aeration will improve the treatment results generally at practically any sewage plant.

Discussion by Uhl T. Mann, Supt., Ley Creek Sewage Treatment Plant, Syracuse, N.Y.

Mr. Mann emphasized the difficulty of Mr. Roe's task because of the many variables such as size, shape of tank, methods of diffusing air, location of diffusers, quantity of air used, and the fact that plants are not equipped to make studies both with and without aeration.

While Mr. Roe referred to the second phase of pre-aeration as that which accomplishes coagulation and agglomeration, Mr. Mann is of the opinion that these are two different processes and should so be considered. According to Mr. Mann, pre-aeration will not provide aerobic conditions in 1 to 15 minutes. On the other hand, air flocculation is an attempt to establish aerobic conditions in order to promote biological action and the period may be from 30 min. to 4 hr. Mr. Mann told of studies at Ley Creek where plain aeration was used for a period of several weeks. While no sludge was returned to the process, a biologically active slime formed on the walls of the tanks and this aided in the improvement of the sewage as it passed through these tanks. Both L. R. Setter and Mann's studies have shown that plain aeration will afford a positive degree of treatment between primary and secondary efficiencies. Mr. Mann believes that pre-aeration or rather plain aeration is good for pre-treatment purposes and that it will help to taper off shock loads on a sewage plant.

Mr. Frank Flood (Metcalf and Eddy, Consulting Engrs., Boston) described the basis for including pre-

Programmers

M. W. Tatlock
Partner
R. Woolpert Co.
Cons. Engrs.
Dayton, Ohio

David B. Lee
Director
Div. San. Engr.
St. H'lth Dept.
Jacksonville, Fla

aeration treatment in three plants recently designed: 1. Nut Island Plant, Boston, using a period of 30 min. to reduce grease and floating solids; 2. Hyperion Plant, Los Angeles, using a period of 30 min. to reduce the hydrogen sulfide content of a highly septic sewage and to add dissolved oxygen; and 3. Allegheny County Plant, Pittsburgh, Pa., to increase the degree of treatment and meet the quality requirements for the effluent.

Dr. Rolf Eliassen (Professor of Sanitary Engineering, MIT, Cambridge, Mass.) emphasized the importance of bubble size in determining the effectiveness of aeration. Fine bubble size (even of micron dimensions) may be obtained either by supercharging and applying vacuum or by applying pressure to the surface of the liquid. The increase of surface per unit volume of air is responsible for greater adsorption. More study should be devoted to practical methods of controlling particle size.

Dr. L. R. Setter, Chemist, USPHS, Cincinnati, Ohio, asked if the pre-aeration of septic sewage would result in the aeration of an air pollution problem—from the hydrogen sulfide liberated. Mr. Flood stated that observation indicated no great concentration of the gas to be present at the preaeration units of either the Hyperion or San Bernardino plants; he considers aeration may accomplish some oxidation or other change in the character of the odor.

Sewer Rental

"Sewer Service Charge Practice" by Myron W. Tatlock, Partner, Ralph W. Woolpert Co., Consulting Engineers, Dayton, Ohio.

According to Mr. Tatlock, "The importance of the use of rates and a rate schedule for financing construction, operation and maintenance of sewerage systems is evidenced by the fact that at least 273 cities of more than 10,000 population have adopted the use of sewage service charges and dropped expenditures for sewage disposal from their general tax budgets and that rental collections totaled more than $25,000,000 during 1948 from the approximately 450 cities now using the plan.

Mr. Tatlock listed the most recent cities to adopt the sewage service charge plan including New York City, and he also reviewed assisting legislation in such states as Ohio, Georgia, and New York State. The need for sewage service charges as a means of obtaining badly needed income has been evident ever since the operation of sewage treatment plants became important to municipalities.

In the discussion of existing rate structures, Mr. Tatlock presented six principal bases including these: Uniform Rate, Number and Type of Sewer Connections, Type of Property, Number and Type of Plumbing Fixtures, Water Consumption, and Miscellaneous. Those structures which depend on water consumption have four subclassifications: Metered water charges, combined sewer and water charges, charges based on metered water and B.O.D., and a fixed percentage of the water bill.

Mr. Tatlock also presented a number of the cities having miscellaneous types of rates, including that of Buffalo, N.Y. where 45 per cent of the income comes from a property tax, and 55 per cent of the annual income comes from water use rates (about 40 per cent of the water bill) Mr. Tatlock did not discuss sewage service charges to industry where the charge is based on a formula related to volume and concentration of waste constituents.

A very short discussion prepared by F. M. Veatch of Black and Veatch, Cons. Engrs., Kansas City, Mo. was presented for Mr. Veatch by Ed Farmer of the firm.

(The second installment of the report on the Federation Meeting will appear in the January issue.)

SELECTIVE USE OF RAW WATER AT BARTLESVILLE, OKLA.

by

W. L. PATTERSON

BLACK & VEATCH, CONS. ENGS.
KANSAS CITY, MO.

THE City of Bartlesville, Okla. has developed a new supplemental source of water supply and has constructed a modern water treatment plant. Water from the new supply will be mixed with highly mineralized water from the existing Caney River supply and softened to produce a water of desirable quality for domestic use. The additional capacity, in terms of supply and treatment facilities, will provide for the increasing demands which are anticipated during the next 20 years.

Bartlesville is a thriving metropolitan City of 20,000 population in northern Oklahoma. Water from the Caney River has been used since 1904, when the original waterworks system was constructed. This supply has been adequate so far as quantity is concerned, but has suffered a serious and progressive deterioration in quality since about 1915, as a result of oil development on the watershed.

Oil Brine Pollution

The brines produced with the oil and allowed to reach the river result in high chlorides and a salty and bitter taste which is objectionable. This pollution has gradually increased, during the period of intensive oil development on the watershed, and in 1944 the water was objectionable for almost half the time. Relatively little further oil development is expected and in view of the current rigid restrictions covering the discharge of oil field brines into the surface drainage it seems improbable that the pollution will increase. However, it is believed that the ground waters which feed the Caney River have been so polluted by drilling that little change in the present level of salinity of the water can be expected.

The gradual and increasing mineralization of the supply has caused per capita consumption to be low. In 1944 per capita usage of City water averaged only 63.2 gallons per day which is substantially lower than the average for cities in this locality. Bottled water was used extensively for drinking and culinary purposes.

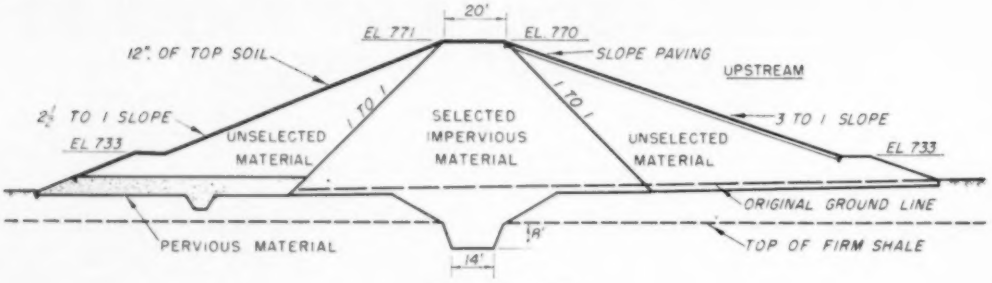
Better Supply Sought

A study was undertaken to find a supply which would be suitable at all times for domestic use and of ample quantity to supply future demands. In establishing limiting characteristics it was concluded that the chloride content should not exceed 200 ppm. and that the chemical quality should permit softening to a maximum of 120 ppm. of total hardness. It seemed certain that an improvement in the quality of the City water would result in increased consumption and in anticipation of demands which appear probable in 1970, the improvements were designed to produce an average of 2.3 mgd. (100 gal. per capita) with provision for peak demands up to 5.0 mgd.

The possibility of obtaining a satisfactory water supply from wells was fully investigated. However, the Caney River Valley and adjacent areas have only small deposits of sand and gravel, none of which are capable of supplying a sizeable municipal water demand. Deep wells are of low yield and unsatisfactory mineral quality.

Consideration was given to the possibility of reducing the mineral content of the Caney River water by ion

Aerial View of Lake and Dam on Butler Creek



Cross-Section of Dam

exchange, or acid absorption, following softening and clarification by conventional methods. There are several types of demineralizing equipment on the market all based on the principle of ion exchange. Construction cost for a 4 mgd. plant was estimated at $600,000 for one type and $803,000 for another. This is not unduly high from the standpoint of investment but the cost of operation for this type of treatment was estimated to be 14.3 cents per 1000 gallons. On the basis of a 2 mgd. demand this would amount to $286 per day which would nearly equal the total revenue of the Water Department.

Another possible water supply for the City is available from the Hulah Dam located on the Caney River about 20 miles above Bartlesville. This is primarily a flood control project but has a conservation pool with a capacity of 3200 acre feet of water. All storage above the conservation pool will be used for flood protection only, but the government can allow use of the conservation pool for water supply purposes. The cost of an intake and pipe line to convey water from Hulah Dam to the City was estimated at $900,000 to which would be added a charge for the water or additional capital cost to be contributed for the use of the reservoir. An alternate plan for using water stored in the reservoir for dilution of the river water would require additional storage in Hulah Reservoir which in turn would require a higher dam and more reservoir land. Consequently the possibility of securing water from this source was rejected as being too expensive.

The fourth and most favorable possibility was the development of an impounded surface supply. An investigation of the adjacent area indicated that it would be impossible to develop a site for a reservoir of sufficient capacity and with sufficient drainage area to sustain the total demands which would develop with the growth of Bartlesville. Sites on Butler Creek, northwest of the City were studied and it was found that a supply could be developed at a reasonable cost, which would furnish a substantial supply. Tests of the Creek water indicated low salinity and hardness and since the drainage area is relatively free of oil production, this source appeared to offer water of satisfactory quality.

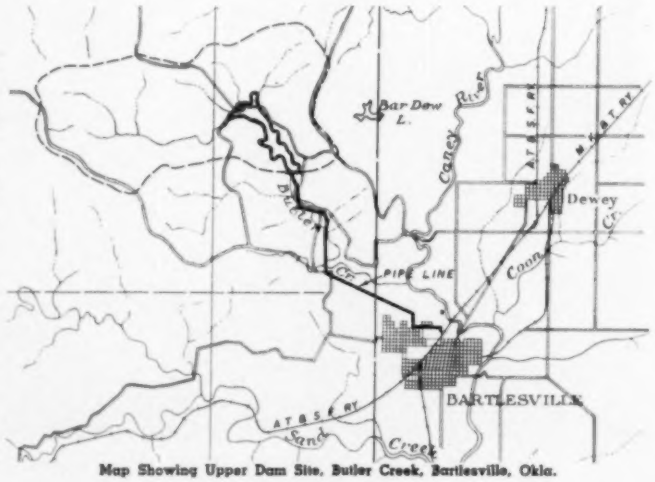
Two Source Supply

The reservoir site selected is situated approximately 5 miles northwest of Bartlesville. The dam now constructed at this location, has a maximum height of 60 feet and contains approximately 150,000 cu. yds. of selected earth fill. The reservoir impounds the runoff from 14.5 sq.mi. of rather rough country and at spillway level covers 330 acres to an average depth of 14.5 feet. The total volume of 4800 acre feet (1,568,000,000 gallons) is believed to be capable of sustaining a continuous draft of 1.5 MGD. under the most adverse conditions indicated by the climatological record which covers more than 40 years.

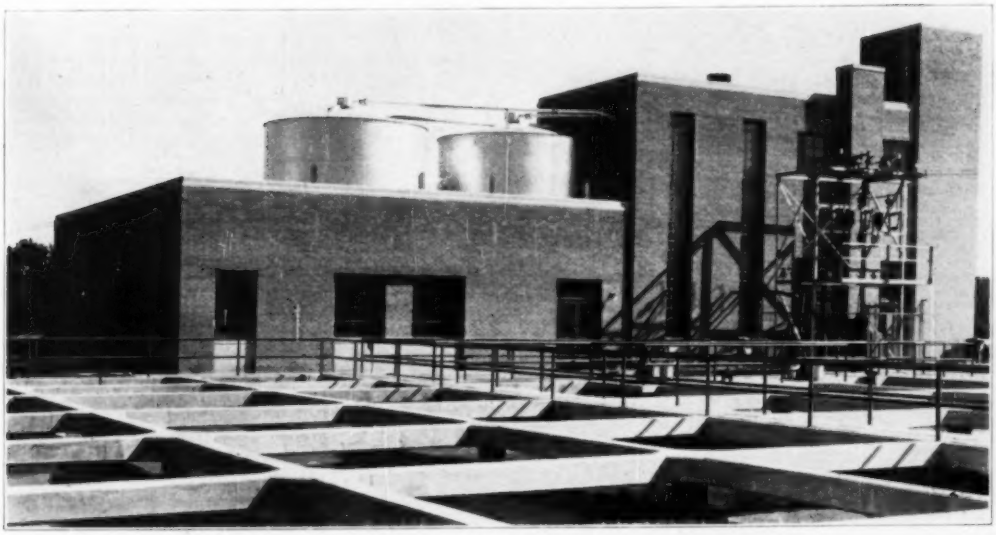
Since the anticipated demands of the City are substantially higher than the estimated safe yield of 1.5 mgd. from the Butler Creek reservoir it was necessary to provide for augmenting the impounded supply with water from the Caney River.

The quality of the water in the Caney river has been under fairly close observation, since the effect of the oil field brines became noticeable, and the results of 71 complete mineral analyses of samples, collected during the period between March 1922 and July 1944, are available. This record, which covers all of the seasons, inclusive of the most severe period of drought so far experienced, presents a conservative picture of water quality and is summarized in the following tabulation:

			Salinity as Chlorides	Hardness: Total	Hardness: Carbonate	Hardness: Non-Carbonate
Numerical	Average	ppm.	288	305	174	131
Maximum	Observed	"	2310	1202	299	803
Minimum	Observed	"	22	88	74	14
Median		"	218	311	174	131



Map Showing Upper Dam Site, Butler Creek, Bartlesville, Okla.



Front View of New Filter Plant—Settling Basins in Foreground

The exact quality of the water from the impounding reservoir will not be known for several years but it seems probable that it will be relatively constant (as compared with that of the river water) and will be about as follows:

Salinity as Chlorides	75 ppm.
Carbonate hardness	125 ppm.
Non-Carbonates hardness	25 ppm.

Chlorides, are not harmful but are objectionable to taste and to a degree which varies with the individual. Many persons can detect the salty taste in concentrations as low as 250 ppm. and 200 ppm. is a widely accepted limit of tolerance for public water supplies. A further analysis of the record shows that, while the river water contains more than 200 ppm. of chlorides for approximately 46.5 per cent of the time, the use of impounded water, to make up approximately 26.2 per cent of the annual production, will keep the concentration of the mixed water below 200 ppm. Due to the fluctuating concentration of the river water, the impounded water must be used at daily rates which vary from 0 to 98 per cent of total production but not over 79 per cent is likely to be needed during any one month as shown in the table at top of second column.

PROBABLE MAKE UP OF WATER NECESSARY TO KEEP CONCENTRATION OF CHLORIDES BELOW 200 PPM.

Month	Percentage of Supply from— Caney River	Impounding Reservoir
January	72.	28.
February	38.	62.
March	21.	79.
April	100.	0.
May	100.	0.
June	100.	0.
July	96.	4.
August	84.	16.
September	70.	30.
October	76.	24.
November	66.	34.
December	63.	37.
Annual Average	73.8	26.2

Treatment Costs

The annual cost of chemicals for clarification, taste and odor control, sterilization and recarbonation is estimated at $5.65 per mil.gal. treated. This estimate is based on dilution for hardness and the use of almost 50 per cent of reservoir water. In case dilution is used only for reduction of chlorides only 27 per cent reservoir water is required and it is probable that the alum requirement for clarification would be increased almost 10 per cent and that the chemical cost would be increased to almost $6.00 per mil.gal.

The cost of softening is quite variable because of the fluctuations in the hardness of the water to be treated. These costs have been estimated for the following conditions:

(a) With 27 per cent dilution with reservoir water for chlorides only, softening with lime to an average hardness of 144 ppm.; cost $12.50 per mil.gal.

(b) With 27 per cent dilution with reservoir water for chlorides only, softening with lime and soda ash to an average hardness of 120 ppm.; cost $15.99 per mil.gal.

(c) With 50 per cent dilution with reservoir water for hardness as well as chlorides, and softening to an average hardness of 120 ppm. with lime, cost $11.78 per mil.gal.

From the standpoint of salinity, the availability of a firm supply of 1.5 mgd. of impounded water, for use in dilution, insures a satisfactory supply, from the two sources, until the maximum daily demand of Bartlesville exseeds 6 mgd. Since the firm yield of the reservoir reflects extreme conditions of drouth, it is certain, that during years of normal run off, considerably more than 1.5 mgd. of reservoir water may be used. As a matter of fact, the entire supply has been taken from the reservoir, since it was filled (Sept. 1949), and it seems probable that pumpage from the river will be limited to peak periods for at least several years.

Since the impounded water is softer and less turbid than that from the river and requires no low service pumping, its use has a distinct economic advantage and it is planned to use this source, to the extent that it is available, over a reasonable reserve for dilutions.

Modern Treatment Plant

In order to utilize the two water supplies to best advantage the City has constructed a modern treatment plant which will clarify and soften any mixture from the two sources, up to its maximum capacity of 5.0 mgd. It is possible, therefore, to keep the salinity of the raw water below 200 ppm. by regulating the mixture and applying such treatment as may be required. The new plant replaces existing facilities which are poorly located with respect to floods, outmoded, and inadequate.

Rear View of New Filter Plant Showing Above Ground Clear Water Storage at Right

The site selected for the new plant is some distance from the river and on higher ground than the original plant. This required the construction of a new Caney River intake and low service pumping station. The new intake is arranged for the installation of mechanically raked screens. Three vertical turbine type low service pumps are installed with a combined capacity of 4 mgd. and deliver water through a 16-inch cast iron raw water line to the treatment plant.

The impounded water is delivered to the new treatment plant by gravity through a flow line of 20 inch prestressed concrete pipe which has a capacity of 5 mgd. The line is equipped with a control valve at the filtration plant which permits withdrawals at any rate up to this capacity.

The filtration plant includes the following treatment units:

(a) *Rapid Mix:* Conventional double vertical flow basin with two vertical shaft high speed mixers. Retention time about 1.5 minutes.

(b) *Coagulation:* Rectangular basin equipped with standard flocculation equipment. Retention time 1 hour.

(c) *Primary Settling:* One basin 100 ft. long and 45 ft. wide equipped with straight line type sludge collectors. Retention time 3 hours.

(d) *Primary Recarbonation:* Pipe grid, retention time 15 minutes. Provision for applying carbon and chlorine for taste and odor control.

(e) *Secondary Settling:* Same as primary basin without sludge removal equipment.

(f) *Secondary Recarbonation:* Same as primary, retention time 33 minutes.

(g) *Filters:* Three units with a capacity of 1.33 mgd. each at 2 gallons per square foot of surface area per minute. Filters are equipped with vitrified clay filter bottoms. Anthrafilt is used as the filter media.

There are two items of design which have saved considerable construction cost. The steel lime storage bins project above the roof of the chemical room, only the hopper bottoms being housed in. Also due to poor foundation conditions, and excessive uplift pressure due to flood waters, clear water storage is provided above ground, in a one million gallon steel tank, which also furnishes a wash water supply. The filtered water is collected in a small clearwell beneath the filters and pumped to the steel tank by vertical transfer pumps.

Other Plant Features

The architectural treatment of the plant is modern. The superstructure is of buff brick and stone on a structural steel frame. Brick facing is carried entirely around the basins and into the building which adds to the general appearance of the combined structure. Mechanical features of the plant include pneumatic handling of softening chemicals, electric elevator for handling miscellaneous chemicals and equipment, master plant control board, dual chlorinators, dual slakers, standby gasoline engine driven transfer pump, high service discharge venturi meter and hand operated crane to handle equipment in the pump pit.

The master plant control panel is located near the center of the operating floor. This control panel contains the river and reservoir supply flow meters and proportioning valve control. It also contains a plant output meter, basin high level alarm, river intake pump controls, transfer and high service pump controls, telemetering recorder from the elevated tank on the distribution system and space for a pH recording meter.

The reservoir on Butler Creek has been named Lake Hudson in honor of Judge R. H. Hudson a long time Mayor of Bartlesville. The City is developing the lake into a beautiful recreational area for the use of the citizens of the community.

The improvements were designed and supervised by Black & Veatch, Consulting Engineers, Kansas City, Missouri and the construction work was performed by several contractors as follows:

Treatment Plant — Long-Sinclair Construction Corp., Kansas City, Mo.

Filter Equipment—E. W. Bacharach & Co., Kansas City, Mo.

Steel Standpipe—Chicago Bridge & Iron Co., Chicago, Ill.

Dam and Spillway—M. E. Gilloiz, Monett, Mo.

Flow Line Pipe—Lock Joint Pipe Co., Turner, Kan.

Flow Line Construction—Osage Construction Co., Oklahoma City, Okla.

The project was directed by Ross Taylor, City Manager of Bartlesville and his successor Chas. Huntress.

Purdue's 5th Ind. Waste Conf. Proceedings Available

A 430 page bulletin covering 43 papers on industrial wastes is now available from Purdue University. This Bulletin Extension Series No. 71 is titled "Proceedings of the 5th Industrial Waste Conference" and covers the material presented at the Purdue Ind. Waste Conf. in Nov. 1949. Copies of this Bulletin may be obtained for $1.00 per copy and should be ordered from Prof. Don E. Bloodgood, Prof. of Sanitary Engineering, Purdue University, W. Lafayette, Ind.

The Examination of Waters and Water Supplies

The Blakiston Co., Philadelphia, Pa., has published the new sixth edition of "THE EXAMINATION OF WATERS AND WATER SUPPLIES" by Edwin Windle Taylor. This sixth edition retains the traditional format and has been carefully revised throughout, and chapters on the gathering grounds and underground supplies have been rewritten. Chapters on waterborne disease, bacteriology of water samples and disinfection of water supplies have been extended and rewritten.

Numerous tables and plates and a 41 page appendix increase the usefulness and practicality of this volume. Consisting of 819 pages the book may be obtained from The Blakiston Co., at $12.00 per copy.

M. W. U. A. CELEBRATES SILVER ANNIVERSARY*

S. S. Anthony Succeeds 25 Year President Dave Moulton

THE Maine Water Utilities Association on Oct. 11, 1950 very appropriately celebrated its 25th Anniversary by holding its Annual Meeting** in the City of Waterville on the Kennebec where the Association was born on Oct. 6, 1925.

The meeting was called to order by President David E. Moulton, Atty. for the Portland Water District, who was elected president at the organizational meeting and who has continued in this office for the 25 years intervening.

The first order of business was the election of officers in which Sidney S. Anthony, for many years Editor of the M.W.U.A. Journal and mainspring in the Association, was named president of the Association. President "Dave" became President-Emeritus. The complete slate is as follows:

President-Emeritus
David E. Moulton, Attorney
Portland Water District

President
Sidney S. Anthony, Sup't
Augusta Water District

Vice-President
Allan F. McAlary, Sup't
Camden & Rockland Water Co.

Secy.-Treas.
Earle A. Tarr, Sup't
Winthrop Water District

Editor
Sidney S. Anthony

Directors
R. K. Newcomb, Distr. Mgr.
Skowhegan Water Co.
L. G. Smith, Sup't
Kennebunk, Kennebunkport & Wells
Water District

J. Elliott Hale, Supt., Kennebec Water Distr. (Waterville) was named Chairman of the Program Committee.

*A report based on a fuller account supplied by President Anthony at our request. We regret the necessity for the condensation.

**The Association holds six meetings during the year.

The Water Distr. Idea Also Born in Waterville

It was pointed out by Dean Marriner of Colby College, Waterville, that the public water supply of this city dated from 1818 and that the Water District idea, conceived by Atty. Harvey D. Eaton of Waterville was, like the Maine Water Utilities, born right in Waterville and was named the Kennebec Water District and chartered as a separate political subdivision by the State Legislature for the purpose of financing and operating a public water supply to serve a group of communities without regard to limitations of the constitutional debt limits of the communities participating.

Accomplishments of M.W.U.A. Recounted by Moulton

As retiring president Mr. Moulton presented a quick review of some of the more noteworthy accomplishments of the Association in its 25 year history. These included development of the now widely adopted method of standardized fire-hydrant markings of green, orange and red to indicate their capacity to deliver water in fire fighting; the supplying of the M.W.U.A. Journal to every water works plant in the State; the pioneering of the scheme of mutual aid by water utilities in cases of emergency, a scheme later nationally adopted by utility organizations during World War II and since; the publication of the hand book on "Defense Training for Water Works Operators," which eventually found its way to all corners of the Country and even abroad; the supplying of three tried and true presidents to head the New England Water Works Assn.—H. U. Fuller, H. J. Clark and S. S. Anthony.

The meeting closed with a presentation to "Ex. Prexy" Dave Moulton of 5 sheep-skin bound volumes of the Proceedings of M.W.U.A. since its organization. These volumes were suitably marked in gold leaf for the occasion.

Brass Hats of M.W.U.A.

Left to Right (Front Row)—J. Elliott Hale, Waterville, Program Comm. Chmn.; Allan F. McAlary, Rockland, Vice-President; Sidney S. Anthony, Augusta, President; David E. Moulton, Portland, Pres.-Emeritus; Earle A. Tarr, Winthrop, Secy. & Treas. (Rear Row)—Herman Burgi, Jr., Portland, Program Comm.; R. K. Newcomb, Skowhegan, Director; L. G. Smith, Kennebunk, Director; W. G. Hartwell, North Anson, Lybrand Goldsmith, Wilton, John Sullivan, Lewiston, all three being members of the Program Committee.

A NEW TRENCHER OF NOVEL DESIGN

Boast Many Features of Practical Interest to Water and Sewage Works Men

by

JAMES W. REILLY
Superintendent
WATER DEPARTMENT
WARE, MASS.

THE new Ware Hydro-Trencher is the result of a long existing need for a medium priced non-cumbersome, easily operated, mobile trenching machine. The original idea was that of providing a machine for service trenching under conditions which conventional trenchers are not usually adapted for.

The Author

Why the New Trencher

In the latter part of 1948 a group of Massachusetts water superintendents, headed by the author, appealed to Mr. John Pilch, president and Engineer of the Ware Machine Works of Ware, Mass., successful manufacturers of construction equipment, such as front end loaders, bull-dozer blades and other similar hydraulicly operated equipment, to build such a piece of equipment mounted on a rubber tired tractor. With the requirements and ideas of the operating superintendent continually being conveyed to him by his close association with the author, Mr. Pilch designed and commenced building what eventually has become the Ware Hydro-Trencher. The first unit built was exhibited to the group of Mass. water superintendents that had made the request. It performed even better than any of us had anticipated. The machine was then turned over to our department here in Ware in the late spring of 1949 to be given a thorough practical test. There is no point in describing the construction of the first machine because the present one is so drastically different. The difference resulted, not because of lack of power, or because of failure, but because of a desire to make the operation of the machine simpler and smoother.

Putting the Trencher to Test

The first job undertaken with the new Ware Hydro-Trencher was the installation of a six-inch main and in a street that was known to be very "tough" digging. We encountered

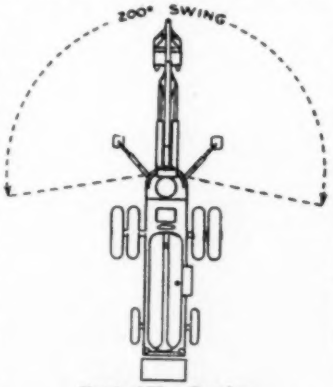
The Author Demonstrating the Ware Hydro-Trencher at the Winter Meeting of the Maine Water Utilities Assn. at Portland, Me.

The Hydro-Trencher Goes to Work

Without pavement breaking preparatory to use the Hydro-Trencher digs in. At left is illustrated the short lateral excavation in connection with a deep cut to reach a main with this novel type of trench-hoe and boulder grabber.

boulders that the conventional machine with 5/8" cable couldn't budge, yet we had no trouble in removing them even from the bottom of the trench. As was stated at the beginning, the machine was originally built with the idea of digging service trenches. However, as we continued to recommend changes and as Mr. Pilch himself studied the machine in real rugged digging, changes were made for about three months and each change was studied under actual working conditions until the machine, as it now stands, was given six month of what is believed to be the hardest digging to be found in New England.

Our original idea that there were hundreds who were looking for such a machine was an underestimation, because when word did get out that such a machine was in operation they came in such numbers and from all parts of the United States and Canada to watch it in operation that it took about half of the author's time to accommodate the visitors. The Ware Machine Works became besieged with requests for them but steadfastly refused to go into production until it was proven that all of the "bugs" usually met with in new machines had been removed. Finally some fifty units were built and distributed through different sections of the United States and Canada. After checking on them in actual operation, as well as continually checking the one here in Ware, the Company is now moving toward full scale production.



Sketch of Ware Trencher

Showing 200° swing of bucket, width of six wheel Oliver Tractor, and hydraulic stabilizing outriggers to right and left of boom.

Features of the Hydro-Trencher

The trenching equipment is mounted on Oliver tractors exclusively. Some have been mounted on Oliver's Model "77" but ours, and the majority of them, are mounted on the Oliver Model "88" dual-wheel rubber tired tractor.

The Ware Meets Up With Some Tough Going

These pictures were made of the Hydro-Trencher owned by the Kennybunk, Kennybunkport and Wells Water District of Maine. Looking into trench on left and toward camera on right is Mr. L. G. Smith, Supt. of the Water District.

There are so many outstanding features of the machine that it is almost impossible to single out any one feature as being outstanding. The smooth simple operation which can be achieved by an inexperienced operator in an hours time is one outstanding feature. Wear and tear on the engine by digging operations is reduced to a minimum, as it is not possible to stall the engine by overloading. The trencher takes its power from the tractor engine. Economy of operation results from the fact that during digging operation the engine runs at idling speed most of the time. And, because of compactness of design, the trencher can work in situations where truck or crawler mounted units can not work. The unit travels from job to job under its own power at 15 to 20 miles per hour, with as little damage to sod or road surfaces as a pleasure car would cause. Two hydraulically operated out-riggers (see pictures) stabilize the machine when digging, and a patented swivel seat allows the operator to transfer his attention from tractor controls to trencher controls with a minimum of effort. The hyduralically controlled bucket, available as an optional extra, is a feature worthy of especial consideration. With this action it is possible to dig almost vertically in a downward direction, eliminating unnecessary lateral excavation when digging up leaks or in digging for manhole construction.

We have found that by hanging a sling or chain over the back of the bucket that we can unload pipe from gondola freight cars very quickly and easily with the use of the hydraulic controls of the bucket. It is also very efficient in removing large stones or boulders from the bottom of a trench as its operation is a prying effect similar to the use of bars on a fulcrum. The down pressure exerted by the piston on the back of the boom itself is amazing. Such down pressure effects, which are entirely lacking on cable operated machines, eliminates the necessity of breaking road surfaces (and even frost) with air equipment in order to give the machine a start as has to be done with cable operated machines. Reverse buckets for loading purposes can be easily adapted by simply removing two pins. The piston, which hydraulically operates the digging bucket, also operates the trap door of the loading bucket.

In Summary

In summarizing what we consider to be the outstanding features of the Ware Hydro-Trencher, we would stress its simplicity and ease of operation, its mobility, its compactness, the elimination of cables, clutches and brake bands, and the power or pressure that can be exerted in the right direction, plus the low cost of operation and the medium purchase price. We believe that these features make it an ideal machine for a large water department's service work, or as a small department's all-around machine.

One Picture is Worth a 1000 Words

The above photograph was submitted by Ted H. Kain, General Manager, Columbia Water Co., Columbia, Pa.

Useful Asphalt Tables

The Asphalt Institute, New York, N.Y., has published a book entitled "ASPHALT—USEFUL TABLES". This handy book as compiled by the Institute contains tables covering all applications of asphalt such as: specifications, working temperatures, temperature conversion table, linear feet covered by various tank capacities, measurement of surfaces, quantity of "unfilled asphalt" joint filler required, etc. A list of Asphalt Institute Members and Institute offices complete the book. It is available from the Asphalt Institute, New York, N.Y.

Sewage Works Federation Passes Important Resolution

In conjunction with the recent annual meeting of the Federation of Sewage and Industrial Wastes Association in Washington, D.C., the following important resolution was passed by the Federation's Board of Control. This resolution, which follows in full, calls attention to the already long delayed program of stream pollution abatement, caused by World War II, and the present need for allocations and priorities sufficiently high to insure the availability of materials and equipment to enable municipalities and industry to construct scheduled waste treatment plants on our more highly polluted streams.

Resolution for the Promotion and Extension of Pollution Abatement Measures

WHEREAS:
Mobilzation for defense places a new urgency on the conservation of water resources, the adequacy of which have been progressively deteriorated by pollution from municipal sewage and industrial wastes discharges; and

WHEREAS:
It is recognized to be in the national interest, as discussed before the Congress of the United States for many years and now enunciated in Public Law 845, to promote pollution abatement measures because the welfare of our people and the expansion of industrial production is dependent on the preservation of water resources; and

WHEREAS:
Efforts of the states and interstate health and regulatory agencies to control this pollution have been intensified in recent years; and

WHEREAS:
After a delay of almost ten years because of World War No. 2 projects have now advanced to the point where actual construction of long-delayed treatment works is imminent; now

THEREFORE, BE IT RESOLVED:
That the Federation of Sewage and Industrial Wastes Associations exert its every influence to insure aggressive pursuit of stream pollution abatement; and

BE IT FURTHER RESOLVED:
That the Congress of the United States in the enactment of legislation for the defense of the nation, and the federal agencies designated to administer such legislation, be fully appraised of the basic importance of pollution-control measures; and

BE IT FURTHER RESOLVED:
That the Federation of Sewage and Industrial Wastes Associations urge that construction and operation of all facilities contributing to pollution control be expedited in this period of emergency by:

1. Allocating, or otherwise insuring by proper priority designation, the availability of sufficient materials and equipment so that municipalities and industries will not be hindered in building sewage and industrial waste treatment systems or in operating or maintaining existing facilities.
2. Appointment of a qualified representative in the sewage and industrial wastes field to advise the National Securities Resources Board, the National Production Authority or other responsible agency in respect to such allocations.

BE IT FURTHER RESOLVED:
That copies of this Resolution be filed with the President of the United States, the Congress of the United States, the National Security Resources Board, the United States Department of Commerce, the National Production Authority, the United States Department of the Interior, the United States Public Health Service, and the Secretary of Defense.

HEADACHES, HUNCHES AND HARD WORK

Pages from the Life of a Superintendent

*(Fifth Installment)**

by

M'KEAN MAFFITT
Retired Supt. of Water & Sewage Wks.
WILMINGTON, N.C.

I MOVED to Wilmington, N.C., to take on the superintendency of this great city's water works on Oct. 1, 1918, during World War I.

On my first morning in town when I went into the hotel dining room I was seated at a table where there were three other people. Being the person that I am, I introduced myself to them. I found that they had been eating without conversation before my arrival. I also found out that one of them was a doctor from Omaha, Neb., one a trained nurse from up-state New York and the other a travelling salesman from a drug house. All had come to Wilmington to help in the fight against the great epidemic of Spanish Flu that was raging at the time. I thought that in taking on the Wilmington job I must have stepped out of the frying-pan into the fire, since help had come from all over the country. Little did I know just what I was getting into. I found that the filtration plant forces were depleted to the point where the Chief Engineer had to stay on duty 24 hours a day. The distribution forces were using part of their equipment as ambulances, that is if they could get drivers for them.

A Philosophy to My Liking

On my first official visit to the purification plant I found the expression of a philosophy that I had always tried to follow but had never seen in print. On the front of the battery of boilers used in the operation of the plant there was conspicuously hung this sign, *"TRUST IN THE LORD! But, keep two gages of water in the boilers on your own account."* That sign portrayed the philosophy of John H. Sweeney, who had been in charge of the plant since its completion in 1881. He not only preached that philosophy, he practiced it.

I found, as you might have suspected, that the general mapping of the distribution system, as well as the filtration plant, was sorely lacking. The maps left by the consulting engineers who had recently supervised the rebuilding of the plant were blue prints of the first proposed extensions. No changes had been entered on the maps and where they had first recommended a 16" main be installed the map was left as if it had been installed. In fact the funds had run short of the demands and the original 4" main was still in the ground, even if the map did show a 16" main. Other conditions were as bad. The maps of the piping in and around the filtration plant and pumping station were only in the heads of the operators. In fact, to save money the engineers had allowed four pumps to be connected into one discharge header which was so valved that a break, as set forth in a previous article, between two valves would shut down the entire plant.

The general maintenance of the plant had been very lax. In fact it seemed that it may have been entirely lacking. Out of nine 16" gate valves I found 5 that had broken stems which made them inoperative. These valves were of an old make, the manufacturer of which had gone out of business, so we could not get new parts for replacement. Therefore we had to devise methods and means of home repairs. The truth of the business is that these valves should never have been installed. They were of the poorest design and the workmanship was worse. They were of the horizontal stem-bevel geared type and the gates dragged into position, that is if they ever got into position. The wedging mechanism was designed for a vertical stem gate with two members, one on each side of the gates. When in the horizontal position one wedge dropped into the space between the gates forcing them apart while the other wedge being on the lower side of the gates dragged, or was forced, in such manner that it wedged the gates tight against the seat faces long before the valve gates ever reached a closed position. Thus it was practically impossible to close these valves without twisting out the stems. This had been done in five cases. The gates

The Author
Honorary Member A.W.W.A.

This is one of a series of "short-stories" by a Water Works Super, who claims that he learned all that he knows about the water works business "the hard way."

We have frequently listened with much pleasure to the philosophy and reasoning of the author, as expressed on the floor of water works meetings and privately. And, we have heard him "preach" a lot of common sense to the younger men and newcomers in the water works business.

If you have missed any of the four earlier articles of this series go back and read them.*

"Trust in the Lord—BUT . . ."
Read the sign I found on the boilers in the old steam plant.

*Earlier installments are to be found in issues of March, April, July and Sept. 1950.

were of cast iron, faced with brass rings rolled into place. They were so weak that in one case the gates had broken in two and the valve abandoned. We had new gates, new stems, new wedge members cast of bronze derived from the old and broken curb stops and other bronze scrap we had on hand. Into the inside edge of the gates we had holes bored for the reception of rollers. The rollers were made in such manner that when the gates were in place the roller edge, or face, came slightly below the outer edge of the gates, thus making a roller bearing effect that worked successfully. All five of these valves had new guts placed in them and we were then able to get a sufficient amount of water into the city to maintain the pressure.

I had suffered many calamities from raising pressure to fight fires, and desired to cease the practice. However, I could not get the co-operation of the chief of the fire department despite the fact that he had more pumping engines than we could furnish water to in case he needed it. With the approval of the National Board of Fire Underwriters we finally managed to get the practice stopped and the fire department started to use their pumpers.

One night about 12:30 a.m. we had an alarm of fire from the downtown section and as usual I went to see what it was. It was in the heart of the business section in a rather dangerous location and looked bad at the start. After the pressure had been increased to 125 lbs. per inch and things seemed to be going in good order I received a message that there was a leak at the 4th St. bridge, over the railroad. Knowing that this was a dangerous location, I hustled over there and found that the 12" main that was hung under the floor of the bridge had separated and the bridge was in danger. I had to make a decision. I could let the leak run and risk the bridge abutement and the bridge, or I could call the plant and have all the town cut out of water.

High Cost of Inoperative Valves

Reasoning that the first duty after purity is pressure, particularly in case of fire, I left the water on and started to closing the valves necessary to kill that particular section of main. Since the previously mentioned lack of maintenance had allowed one of the two 12" valves, that cut out only the bridge section, to become inoperative it became necessary to close one 8" valve, three 6" valves and one 12" valve. During the period of time that was necessary for the emergency crew to operate these valves I stood on the bridge at midnight, watching the glow in the sky from the fire, when I felt the bridge settle down beneath my feet.

The bridge was a two pass, through truss highway bridge about 100 feet in span over a multiple line of railway tracks. The end abutments were of brick masonry set into the slope of the railway cut. The footing of the abutment was some 12 feet above the bottom of the cut thus allowing the water to break under the abutment and wash out the soil beneath the footing. The bridge settled about 14 inches but remained in fair alignment.

We managed to make repairs to the mains as well as the bridge and pavement, at a total outlay of about $2,750.00 all of which, in addition to the risks we suffered and the sweat we lost while it was going on, could probably have been saved had there been an operative 12" valve on either side of the bridge, which I assure you there was when the repairs were finished.

Salt Water Troubles and All Boilers Out

The summers of 1919 and 1920 were very dry. The water in the river was very low and it being a tidal stream, ocean water backed up to our intake and we had a terrible time with salt water and the effects of chlorides. At one time the chloride content of the water was from 1500 to 2000 PPM, but it was either pump that or shut down. We lost so many boiler tubes that at one time we had all three B&W 150 HP boilers out of service and were depending upon a 142,000 gallons capacity tank to hold until we finished rolling the tubes in one boiler. After we managed to get one boiler back in service and the pumps started we figured that within 30 minutes we would have been out of water and the city would have been dry.

Many recommendations had been made to the governing body that we take steps looking towards a better supply; but, as is so often the case, an unadvised public forced the wrong decision. I remember one conference about the condition of the water supply where, after a detailed survey of the river for determining the highest reach of salt water above the intake, one citizen made the remark that his friend, a river-man, had told him some years previously that he had drunk the water from the river at several places during the high chloride content and that it was at that time free of taste and odors. Despite the fact that we had a technical survey of the river, with detailed determinations of the chloride content at extreme high tide at each mile point up the river from the plant, the recommendation of the citizen on the strength of the statement by the river-man was adopted and no steps were taken to preclude the encroachment of ocean water at the next low water period. Therefore during the next summer we had another seige of ocean water and we were in almost as bad condition as we had been the year before. But in the meantime the citizens had become dissatisfied with the conditions and council then, upon recommendation of the State Board of Health, authorized the extension of the intake to a point about 5 miles up stream where it seemed that we would be at least greatly relieved from the encroachment of ocean water. This extension, along with certain improvements in the plant enabled us to carry on free of chlorides for a period. But, nature takes no cognizance of man's desires and the dry weather continued to increase and the river to get lower at each succeeding period of drouth, and it was not long until the high chloride water reached our up river intake and we had recurrence of bad water. The condition finally became so critical that the governing body decided to follow the previous recommendations and we extended our intake 22 miles up the river to a point on the up stream side of a dam, gates and navigation locks. The ocean water can never reach this point unless the tide rises some 12 feet higher than it has ever been known to reach before. If it does it will not make much difference, because there will be very little of the city left above water to suffer.

Installing Mains Under Railway Rights of Way

Within recent years there has been much discussion of the best manner of installing water mains in and under railway yards. To all of these queries I answer, "The only way to prevent accidents under r a i l w a y yards is to stay out of them." This seems to me to be the best practice, though of course there are times when it becomes absolutely necessary to run water pipes under railway tracks. To meet the conditions brought about by our soil we adopted the method of running the water pipes, that of necessity had to be installed under railway tracks, in a concrete culvert and/or taking the weight of the tracks on pile bents driven to either side of the water

mains. This method of installing mains under railway tracks has proven satisfactory, and we have had very little trouble with mains thus installed. But back in the 1890s when some of Wilmington's larger feeder mains were installed they were laid in quicksand beds under railway tracks with slight, or no, consideration given to vibration and creeping effects. The results have been almost catastrophic to us. We have had 16″ mains to pull apart at bends that were not protected; or at corners that were not braced in any manner. These troubles became so frequent that a cryptic message saying just "Seaboard Yards," was all that was necessary to send the crews running to the dangerous places.

After so many of these calls had been received I determined to place on one or two of these joints the Maffitt Coupling, which I illustrated in the first article of this series (see issue of March 1950). We installed one of these couplings and, in addition, strapped the pipe with long bolts reaching two lengths of pipe in each direction from a 22½ deg. bend that had pulled apart. We tried to jack the pipe back into position but failed, mostly I believe because we could not get backing sufficient to kick against with a screw jack. So, to be safe, despite the fact that the main was laid in a quicksand bog I placed these extra long bolts on the pipe. This has so far been successful.

Special Caulking Tools Designed

We had so much trouble with leaks in large mains that were under, or parallel to, railway tracks that we designed and had built peculiar caulking tools. When I had them made the old foreman said that he had never before heard of anyone standing on the bank and caulking a joint on the bottom of a main, as I proposed to do. Nevertheless these tools worked and saved many a hard job from being almost impossible.

In this type of soil, water bearing and mostly of quicksand materials, it is almost impossible to get to the bottom of a joint and properly caulk it without making an excavation that will take in the adjoining territory, particularly when you are short on equipment and help as most of us are. So I had these tools made about six feet long, bent at one end so that a man could lie prone on the top of the pipe, reach under the pipe in the sand and water and place the face of the tool against the lead joint then signal for the man on the bank to drive it home, using a small sledge hammer instead of the regular caulking hammer. This works beautifully. It relieves the laborers from having to hammer under water and smash as many hands as they have available. Since I could not make a detail drawing of the tool I had the blacksmith go to the pipe yard and work the tools until they met the requirements. The bending was done by the cut and try method until they fitted the curve of the 16″ main. Of course they could be used, but less advantageously on smaller, as well as larger, pipes. In fact, at one blown joint on a 24″ main where the leak was at the top of the joint, but where the flow of water was so great that a man could not get to the joint, we used a six foot long tool made especially for that job. This was such a tool that one man could stand on the pipe, letting the water flood around his legs, another holding the upper end of the tool, while the third man used the hammer. It certainly works nicely to have these tools handy so that a man will not have to dive under water to try to make a joint while he holds his breath. We did not have diving suits, and had we had them they would probably have been of no use to us.

Repairing Split Pipe

One night about 2:00 a.m. during a terrible electrical storm we had a transformer pole on a power line to fall. The edge of the transformer flange hit the intake line near its base and spit the 24″ pipe for a distance of some 9 feet. The break was in a swamp where it would have required a very large amount of work to replace this joint of 24″ pipe. Under the very best of conditions with the equipment we had on hand it would have been a hard job, but under the conditions that existed it would be terrible. The pipe was laid upon a pile bent trestle. The underlying soil was so soft that a man would sink to his hips if he stepped off the pipe line, pile caps or other support. So, this job would have required the building of a platform, supports and other means of standing so that we could have even a chance of getting to the work. Since the intake line was the only supply that we had other than one emergency line that we did not want to use, unless it proved absolutely necessary, we decided to strap this joint of pipe and see if we could not stop the leak. We made some clamps of very heavy wrought iron, large ears or lugs at the connecting points of the clamps, and using heavy bolts we placed these clamps upon the pipe and drew them tight. Beginning at the end of the crack away from the bell into which the crack ran, we drew these clamps up, all the time hammering the pipe with small machinist's hammers so that the vibrations of the pipe would tend to seat the cracks together in the proper manner. After going over these clamps several times, drawing them tighter and tighter each time, we had so reduced the leakage that it was barely visible. Calling it a job, we went home and to sleep. The clamps are still there and there is no leakage as yet after the intervening 15 years.

Wilmington's Pumping Station

Motor-driven Centrifugals; Stand-by Steam Pumping Engine; Emergency Gasoline Engine Pump Drive.

Sewer Troubles

Our sewerage system is about as old as the country in parts, that is. We have dug out some very peculiar items, pieces or adjuncts, the use of

which we do not know. We found 3″ TC pipe with joints 3 feet long, 4″ pipe 4 ft. long, etc. Some of these B&S joints in these pipes were made by pouring molten sulphur into them. In one case we found a homemade 4″ gate valve in a 4″ TC pipe line, the joints in the line having been poured with sulphur. Why the gate valve in a 4″ TC pipe line we have never been able to determine, unless the pipe line was used as a sub-soil drain line. Then upon closing this valve the subsurface water would not drain away, but in wet weather the valve could be opened and allow the subsurface water to drain down. Since we did not know from whence this line came nor to where it went we had to be satisfied with the above explanation. In another case we found ¾″ brass nipples fastened into the TC pipe. A hole had been left in the pipe, the brass nipple placed therein with a small amount of threaded section protruding into the inside of the TC pipe. This nipple was then clamped to the TC pipe with a lock nut on the inside of the pipe and one on the outside of the pipe. The nipple was capped over, so there was no telling for what it had been used. In the examination of these odd pieces of pipe we found that the scale upon the pipe was like a postage stamp pasted upon an envelope. The vitreous scale was not integral with the pipe. Some one, possibly the Clay Pipe Mfgs., Assn., informed me that this pipe was made in England before the present method of glazing TC pipe was accidently found about 200 years ago.

The local collection system is composed of numerous old private sewer lines, one old public owned system and the additions that the city government has added from time to time. Therefore we have numerous conditions that we hope never beset other operators. For instance, in one street we had several cave-ins of the surface pavement. The pavement would drop into a hole and we would go there, dig it out and find a broken TC sewer line. Assuming that for some unknown reason the sewer line had broken and taken in the sand, thus causing the cavity, we would refill and begone. Soon thereafter we would have another cavein at the same place, find the same trouble, do the repairs and begone again. Upon the third cave-in I determined that there was some other cause than simply a broken joint of TC pipe. I ordered the repair man to dig down and find what was causing this trouble. At about 2 feet below the pipe line he found an old wooden-box type drain, the roof of which had rotted away, thus allowing the sand to run into the old drain until it created a cavity sufficient to cause the breakage of the superimposed TC pipe. We had assumed that the TC pipe was causing the trouble, but found that other causes were in operation when we dug down to them. These old-time wooden drains must have been the usual practice when the town was young and inexperienced. We have had to change the location of one 12″ water main because we found that under the first location there was one of the wooden-box drains running parallel with the street line. As we did not know from whence it came nor where it was going we dodged it by angling across the street to a new location.

Sand Catchers

Since our sewers are so old, some rather poorly built and considerable of them in quicksand beds, we have always had more or less run of sand in them. As long as the sand runs it does not bother very much. But in one case we had a very deep line running diagonally across one block of street where there was a considerable pocket in the sewer main. The sand would accumulate in this dip, or pocket, until it caused a stoppage and the clearing of the main was of considerable expense. We therefore decided to trap this sand before it reached the deep portion of the main. The trap was built into the bottom of a standard manhole. As the trap would fill with sand we made periodical inspections and cleaned it whenever necessary. At first this was simply a manhole with the bottom some 2 feet below the run of the sewer, allowing the sewage to flow into the manhole, discharge its sand content and flow out again. This worked quite well utnil the collection of scum on the top of the sewage in the manhole would break off in chunks and stop the outlet pipe. To eliminate this condition we had made some 8″ TC pipe joints with a 2″ x 10″ slot cut in one side and a 6″ x 12″ slot cut in the other side. These joints were then laid across the manhole in line with the run of the main. The larger slot in the special pieces was placed at the top for use by a scoop or other cleaner. The smaller slots at the bottom of the pipe to be used as sand catchers. As the sewage would fill the manhole to the flow line the floating matter would then carry on through the pipe line and not cause the stoppages that we had been subjected to.

Replacing Blown Plugs

At one time we had a 16″ leaded plug to blow out of a 16″. The plug had not been braced and the constant pressure of the water had caused the plug to gradually push the very soft lead out until the entire plug was blown out. The aforementioned 16″ valves did not hold as well as they might have and we had considerably more water in the line than we could manage with hand pumps. Since we did not want to call the fire department to pump sand with their fire pumps, and since we did not desire to risk the disruption of more valve stems by extra strain on them, we had to, as one foreman expressed it, "Use our noodles."

Within a few feet of the leak we had a fire hydrant, the nozzles of which were about 7 feet above the center line of the 16″ main. In looking at this hydrant I thought that if it was just low enough it would carry off all the leakage water and allow us to make a nearly dry joint. So, then why not lower the hydrant. Since this was impractical, then why not raise the water to the level of the hydrant nozzle and allow it to drain off that way; but how? Then the idea hit. Use a rubber packing washer, or gasket, against the inside shoulder of the bell, jack the 16″ plug against the gasket, stop the flow of water until we could pour and caulk the joint. I explained the job to the foreman, and since he and I had been fishing together several times, I pointed into the hole in which there was sufficient water to half cover the end of the 16″ bell and said, "Over-board." He understood, jumped into the water, placed the gasket on the face of the plug, tied it with string, to hold it in place, put the plug against the inside shoulder of the bell, placed the jack against a backbrace and screwed it home. It held. Before the water filled the main up to the level of the nozzles of the adjacent hydrant we had the joint poured and caulked. Placing what we believe is the proper bracing behind the plug, we filled up and were satisfied.

We have used similar means with smaller plugs. In other cases we have used 6″ & 8″ plugs tapped for 2″ pipe. Using an old 2″ valve, a 2″ brass nipple into the plug, running 2″ galv. pipe from plug to surface, thus allowing the leakage water to run out of the main while we yarned and poured the joint. This procedure saves time and danger of disrupting old valve stems and gates.

(To be continued)

THE OPERATION OF ONE SMALL WATER WORKS*

by

JOHN J. KAPP, JR.
Superintendent
WATER SUPPLY AND SEWAGE DISPOSAL
HALEDON, N. J.

THE Haledon Water Supply is impounded in a surface water collecting reservoir formed by an earth dam with a concrete core wall 600 feet long imbedded in bed rock.

The reservoir proper covers 75 acres, has an average depth of six feet, holds approximately 200 million gallons of water and a storage period of 300 days. It has a drainage area of 1.6 square miles. The water shed has a safe yield of 600 thousand gallons per day.

An aerator of 2 million gallon capacity per day is located at the foot of the down stream side of the dam, and is of the involute spray nozzle type.

The Filtration Plant

The coagulation basin at the filtration plant is constructed of concrete, is 25 ft. wide by 50 ft. long and 14 feet deep. It has two floors and two baffles.

There are five filter units of the rapid sand mechanical gravity type, with an air filter bed agitator and a water wash system.

A filter wash water basin is located underneath the five filter units, is constructed of concrete and is 25 by 60 feet long and four and one-half feet deep.

High and Low Service Systems

The low service clear water basin for the storage of the finished water is at elevation of 357 feet. It is constructed of concrete and has a capacity of 170,000 gallons.

There are two high service clear water basins, elevation 592 ft., of 350,000 gallon capacity.

The high service pumping station is located adjacent to the filter plant, elevation 369 ft. It contains two centrifugal pumps, one of 60 ft. head and another of 140 ft. head, a total of 200 feet head. They are connected in tandem. There is also a stand-by set. The pumps are of De Laval make and have two Fairbanks-Morse 20 HP motors.

There are two supply lines, one a 16 inch low service main 2.8 miles

The Author

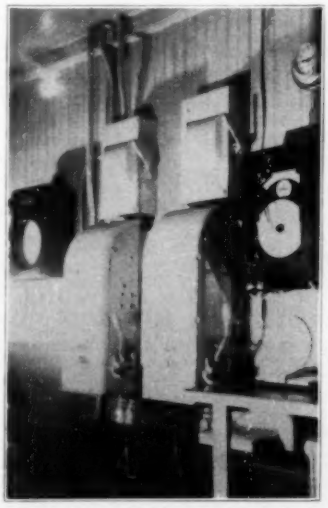
long and delivers the water by gravity to the distribution system in Haledon.

The second supply line, a high service line of 8 inch size and 3.0 miles long, delivers water to the higher altitudes and to a steel tank of 75,000 gallons capacity, located at the other end of the system at elevation 485 feet. An altitude valve controls the water level in this tank.

The low service distribution system is made up of 12-8-6 and 4 inch lines, and that of the high service is made up of 8-6 and 4 inch lines. Valves are set at irregular distances. There are 149 hydrants connected to the grids.

Water Treatment

The water passes from the storage reservoir through a 16 inch main to



Remote Control Gages and Compensators

the coagulation basin. Before the water enters the coagulation basin it is treated with aluminum sulphate in dosages of from two to three grains per gallon.

In the pre-chlorination practiced Chlorine Dioxide is added just before the aluminum sulphate. The dosage varies from two to three parts of chlorine to two to four tenths parts per million of sodium chlorite.

The solution of chlorine and sodium chlorite passes through a Chlorine Dioxide Generator then mixes with the raw water as it enters the coagulation basin through a 16 inch hydraulicly operated cylinder valve, which in turn is operated by a Clayton four way pilot valve. The pilot valve in turn is operated by a float valve. A chlorine residual of at least one part per million is constantly maintained on top of the filters.

A ten inch header pipe with two inch perforations acts as a mixing device, the water then passes over a five foot baffle, flows to the other end of the basin where it enters the upper floor of the basin through a two foot slot across the length of the basin, thence flows to the other end, over another baffle, and thence through a channel to the filter units. The height of the water in the filter is controlled by a hydraulicly operated cylinder valve.

The coagulation basin has a retention period of from one to two hours depending on the draft which runs from 500 to over 2000 gallons per minute peak loads.

The sludge from the coagulation basin is removed monthly, by flushing same with fire hose. The sludge from the coagulation basin is discharged into a sludge receiving basin.

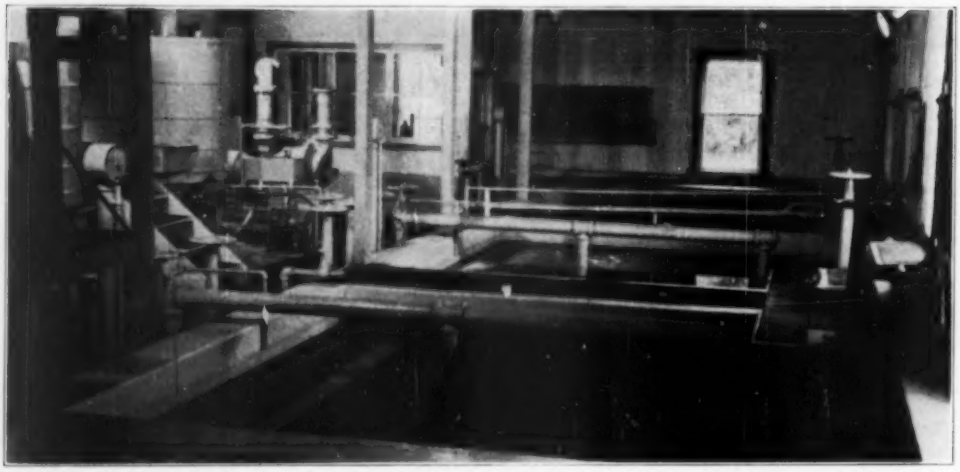
In the center of each filter unit is a cast-iron manifold to which is attached a perforated grid of one and one half inch brass laterals.

Filters Rebuilt and Modernized

During the year 1948 it became necessary to rebuild all filters due to the wearing of the Williamson strainers. The same were replaced with carborundum plates, using anthrafilt in place of gravel and sand.

The rated capacity of the filter plant is 1.6 million gallons per day. The

*A paper comprising a part of a Panel on "Small Water Works Operation" on the program of the New Jersey Section of AWWA. Printed by permission of the Association.



Interior of Haledon Filter Plant

Showing Alum Solution Tanks and Feed Ejector Boxes; Air Blower for Filter Washing. Beyond is One of the Laboratory Rooms in Which Microscopic Examinations Are Made for Algae Control.

filter output varies from a 500 thousand gallon rate on Sundays to a 2 million gallon peak rate on week days. The variation in the output is due to a number of industrial plants. The filter runs average from 24 to 36 hours between washings.

The raw water is a soft colored water, it has a turbidity of a minimum of 15 p.p.m. to a maximum of 45 p.p.m. The apparent color varies from a low of 20 p.p.m. to a high of 60 p.p.m.

The alkalinity of the raw water varies from a low of 40 p.p.m. to a high of 60 p.p.m. The iron content varies from a low of .01 p.p.m. to a high of 1.8 p.p.m., and manganese content varies from a low of .01 to a high of .3 p.p.m.

There are two creameries on the water shed property that discharge creamery wastes into the streams entering the reservoir. Through threat of legal action, the larger of the two creameries installed a number of treatment tanks, chlorination of effluent, and sludge drying beds. The dairy waste discharge causes a great deal of algae trouble, particularly during the summer months when the water does not overflow the spillway.

Algae Control Program

A close watch is kept on algae growths in the reservoir, in order to minimize consumer complaints of tastes and odors from this source.

Copper sulphate is used for algae control. The amount used is determined by the method of D. M. Monie, (see *W. & S. Wks.* Reference & Data Issue, 1947, page R.-118) using copper sulphate and phenolthalin indicator. This method has been found very simple to employ and very satisfactory.

Filters are cleaned daily, using three minute air agitation followed by 10 to 15 minutes water back wash at the rate of 1000 g.p.m. at 5 pounds pressure through a low lift pump.

Soda ash is used for pH correction of the filtered water. A pH of 9.0 to 9.8 is carried in the finished water as it leaves the plant, followed by post chlorination as final treatment. A final chlorine residual of from 2 to 4 p.p.m. is maintained in the water leaving the plant.

This paper is being published primarily to compliment the man who presented it as a part of a panel on "The Operation of Small Water Works" before the New Jersey Section of A.W.W.A.

Many were impressed with the grasp of modern water treatment practices and plant design and facilities possessed by the speaker whose gray hair belies his enthusiasm, scientific curiosity, and ability to pack an unbelievable amount of work into the eighteen hour day that he keeps as "Superintendent-Operator" of water work, sewerage, and "what-have-you" at Haledon.

Perhaps the most impressive part of Sup't Knapp's talk, and his reply to questions, was his unusual familiarity with, and understanding of, laboratory control tests which somehow he finds time to conduct in connection with the operation of Haledon's water purification plant.

Daily laboratory analyses consisting of turbidity, color, alkalinity and pH are made daily. Chlorine residual tests are made 2 to 4 times daily. Bacteriological tests are made daily. Iron and manganese content in the raw water are noted particularly during July and August when they increase considerably.

Microscopical examinations are made of the raw water whenever the turbidity increases or when the pH of the raw water increases beyond 7.8.

Of interest, it may be stated that some of the various Wallace and Tiernan Chlorinators and chlorine residual recording machines, were installed at our plant for observation and perfection by W&T technicians.

The Water Department is part of the Public Works Department and consists of a "Superintendent—Operator," (yours truly) a utility man, a meter reader, a water clerk and a number of laborers who are used both in the water, sewer and road departments.

Water bills are rendered quarterly except industrial users; these are read monthly but billed on a quarterly basis. There are 1900 services, they are divided into three districts one being read each month.

The department makes all water and sewer service connections including setting of meters at the owners' expense.

Water and sewer mains are also extended by the Department. All maintenance work is carried on by the Department.

MINNESOTA SECTION MEETING

A Report
by
HARRY A. FABER*
Editorial Associate
WATER & SEWAGE WORKS

THE Minnesota Section of the AWWA held its 34th Annual Convention in St. Paul, Minn., on September 6, 7 and 8 under the chairmanship of Arthur F. Mellen. The hospitality of the Twin Cities was extended in addresses of welcome presented by Hon. Ed. K. Delaney, Mayor of St. Paul, and by Milton Rosen, Dir. of Public Utilities, Minneapolis.

A feature of the business luncheon of the Section was an address by Harry E. Jordan, AWWA Secretary. Mr. Jordan summarized the present status of civilian defense planning at the Federal level as "plans but no authority." He recommended that enabling legislation be formulated for 1951 sessions of State legislatures; advised that the water works industry participate in all civilian defense planning; emphasized the primary importance of mutual aid programs for all utilities.

An outdoor luncheon, provided by the St. Paul Water Department, was held in the park-like picnic grounds of the city's filtration plant. S. A. Mortinson, Pres., Board of Water Commissioners, presided and L. N. Thompson, Gen. Mgr. of the Water Department, discussed "What Makes a Water Works Work."

Officers Elected

Officers elected to serve for the coming year are:

Chairman—R. M. Jenson, Supt., Water Dept., Grand Forks, N.D.

Vice-Chairman—Rhea Rees, Supt., Water Dept., Sioux Falls, S.D.

Secy.-Treas.—Leonard N. Thompson, Genl. Mgr., Water Dept., St. Paul, Minn.

Trustees—Prof. G. J. Schroepfer, Univ. of Minn., and Howard J. Sowden, Water Dept., Fergus Falls, Minn.

Director—Ross A. Thuma, Supt. Filtr. Plant, St. Paul, Minn.

TECHNICAL PROGRAM

"Problems in Water Supply During Floods" was the title of the first paper on the technical program. A wide variety of experiences were reported by William D. Hurst, City Engineer, Winnipeg, Manitoba; R. M. Jenson, Supt., Grand Forks, N. D.; and Arthur E. Williamson, Sanitary Engineer, State Dept. Health, Bismarck, N.D.

We regret the space limitations which make it necessary to publish Mr. Faber's report of the Minnesota Section meeting in such condensed form. Curtailed presentation of the report seems preferable to further delay in its publication.—The Editors.

Mr. Hurst had an exciting story to tell of flood conditions in the spring of 1950, and he told it well. In this, the largest flood the area has experienced since 1861, maximum flood stage of the lake level was thirty and one-third feet above normal. In the eleven days, April 31 to June 10, one-sixth of the metropolitan area of Winnipeg was covered to a depth up to 12 feet. The municipal water supply never failed.

A committee of utility officials was organized with full authority to take all necessary emergency measures. About 5,000 people were evacuated from seven of the nine sewage pumping stations during the flood. Sewers are generally located adjacent to water main and substantial leakage of sewage was known to occur. The maintenance of adequate pressure in the water distribution system was essential, and special instructions were issued to handle leaks and breaks in mains so that protection was provided against cross-connections and contamination. Finally, the delivery of a Diesel engine from Peoria, Ill., in only 36 hours, made it possible to generate electricity and thus pump at a continuous 10 mgd. rate.

Upon orders from Dr. Berry of the Provincial Health Dept., chlorine residual in the distribution system was increased—first to 0.5 ppm. and then to 0.7 ppm. For main sterilization, an application of 50 ppm. chlorine was made and the water was held for a 4 hour contact period before flushing. Over 10,000 lb. of chlorine in excess of normal requirements was used during the floor period, and no case of water-borne disease was reported which could be attributed to contamination of the water supply. Additional chlorinating equipment was loaned by the City of Ottawa, including a 500 lb. per 24 hour capacity portable chlorinator; a portable chlorinator of the same type was purchased by the City of Winnipeg. The equipment was used to sterilize mains following the repair of 45 breaks in the system—the cost was approximately nine dollars for each sterilization job.

Mr. Hurst reported the city had learned certain lessons through this experience: more consideration should be given to the provision of adequate stand-by equipment; radio communication is essential in emergency direction of field crews; and planning for future needs should include an employee training program.

Mr. Jenson discussed conditions in the Red River valley during the 1950 spring floods, citing data concerning the infrequency of such unusual conditions. During the lifetime of the Grand Forks water filtration plant (52 years) no difficulties had been experienced prior to 1948. Water levels were so high during the past spring that it became necessary to plug the sewer ordinarily used to carry away filter wash water, and to employ a fire department pump to discharge the water to waste. An emergency pumping unit is to be installed at the filtration plant for handling this condition more adequately. A larger stock of water treatment chemicals, especially chlorine, is another need made evident by past experience.

Mr. Williamson described flood experiences in other sections of North Dakota. In certain areas damage was due largely to ice. The State Health Department was particularly helpful in assisting smaller communities where the facilities of water departments were limited.

"Three Years' Results of the Numerical Rating System on Minnesota Water Supplies" were reported upon by O. E. Brownell, Public Health Engineer, Minnesota Dept. of Health, Minneapolis.

Mr. Brownell's paper "Numerical Rating System for Municipal Water Supplies" was published in the AWWA Journal, September, 1947. This system, based upon evaluation of four major divisions (source, water

* Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

moving equipment, distribution system, and standard of operation and of operators' qualifications), has been used in Minnesota for almost four years.

Marked improvement has been shown each year and the projection of trends indicates that, by 1952, all supplies rated so low as to be potentially dangerous may be eliminated. The numerical rating system has been proven beneficial in providing municipal officials with a guide to present conditions and to future improvements.

At the end of 1949, water of adequate safety was furnished to 50 per cent of the state's population; this represents about 85 per cent of the total number of supplies. Mr. Brownell urged broader use of rating standards, preferably under the sponsorship of the AWWA or of another national association.

"Proposed Water Works Improvements at Minot" were described by Charles R. Podas, Associate of Pfeifer and Shultz, Consulting Engineers, Minneapolis.

The present wells at Minot are now supplying about the maximum quantity of ground water available and engineering studies indicate the need of a 6 mgd. treatment plant to utilize surface water from the Souris River. The cold-lime process has been selected as most practical and economical for treatment of a water having about 350 ppm. hardness and 1,000 ppm. total solids.

Equipment of the plant will include: aeration; upflow contact basins having a minimum of one hour detention; automatic sludge removal facilities and mechanical dewatering with provisions for future drying and calcining; recarbonation using carbon dioxide produced from locally available lignite; pre- and post-chlorination with residual recording units; and remote control devices.

Symposium on Corrosion

Two papers were presented on the subject of corrosion:

"Causes and Control" by W. C. Thompson, Chemist, Northern States Power Co., Minneapolis, and

"Stabilization of Water" by William Yegen, Supt., Filtration Plant, Bismarck, N. D.

Mr. Thompson, in reviewing the causes of corrosion, used lantern slides to illustrate various types: direct chemical attack resulting in general corrosion; pitting or localized attack; erosion resulting in dezincification or caustic embrittlement; and bacterial corrosion due to activity of sulfate or iron reducing bacteria. The control of corrosion is more dependent upon characteristics of the water than upon the use of corrosion-resistant metals. To alter the characteristics of water, it was pointed out that dissolved oxygen may be removed by mechanical or chemical methods, and that alkalies, phosphates and chromates may be added. There is also a need for protective coatings and cathodic protection devices.

Mr. Yegen described the details of a method developed in the Bismarck plant and employed for the past nine years to produce a highly stable water. The finished water after lime-soda softening contains about 70 ppm. of hardness, of which about 20 ppm. is calcium. The treatment devised requires maintenance of pH close to 8.6 (after recarbonation), and the Ca to Mg ratio is most important. It appears that an equilibrium exists when calcium hardness equals magnesium hardness or, better, when the calcium hardness is the lower of the two. When this condition is maintained (and a formula has been devised for plant operation), no scaling occurs—even in heat exchangers.

"Are Your Public Relations Showing?" was the question asked, and answered, in a paper presented by E. L. Filby, Black and Veatch, Engrs., Kansas City, Mo.

"It don't make no difference—" some officials may say about public relations. "It don't make no difference only if the utility is dead!" said **Mr. Filby.** Public relations show, and at all times—the public must be given an opportunity to understand the problems, the progress and the function of a utility. This can be done by making available simple, concise, understandable, illustrated reports. The utility office, its personnel and equipment are important; and continual advertising is needed to maintain good relations.

"A Summary of Chlorination Principles and Practices" was the title of a paper presented by Harry A. Faber, Research Chemist, The Chlorine Institute, Inc., New York.

Other features of the technical program were a panel discussion ("Well Problems" and "Distribution System Problems"), a question and answer period (prizes awarded for questions which stumped the experts), and motion pictures on water works subjects.

Leader of the panel discussion on "Well Problems" was C. F. Wimer, Supt., Hastings, Minn. Leader of the panel discussion on "Distribution System Problems" was George J. Troman, Mandan, N. D.

George J. Schroepfer, Prof. San. Engr., Univ. of Minn., presided very capably over the panel of experts in the question and answer period.

Hydraulic Diagrams No. 3

Contractors Record and Municipal Engineering, London, Eng., have just released the third in its series of Hydraulic Diagrams, entitled "Design of Surface-water Sewers; Frequency of Rain-storms." The first of this series was entitled "Flow in Circular Pipes and Culverts," the second was entitled "Flow in Pipes, Culverts, Channels and Streams; Flow in New Cast-Iron Mains; Flow over Broad-crested Weirs."

The two diagrams in No. 3 are printed on heavy serviceable paper and are folded to a pocket size of 5 x 7½ inches, with two heavy cardboard covers attached. The whole opens up to a 15 x 20 inch size. The chart on Surface-water Sewers is 17 x 12½ inches and gives information on gradient, diameter of sewer in inches, time of flow in minutes, velocity in feet per second, time of concentration in minutes and impervious area in acres.

The chart on Frequency of Rain-storms, gives the probable frequencies of rain-storms, number of storms of this duration and precipitation occurring in 100 years and duration of storm. Also included are three tables covering impermeability of surfaces, comparison of rainfall formulae and intensities of storms liable to occur once a year.

Third National Public Health Engineering Conference

Under the sponsorship of the Civil Engineering Department and the Engineering and Industrial Experiment Station of the College of Engineering of the Univ. of Fla., the Third National Public Health Engineering Conference was held in Gainesville, Fla. on Oct. 23-24. Subject of the conference was *Suburban Sanitary Services.* Representatives of the Florida Health Department and the University staff participated in planning and presenting the various topics on the program, all under the chairmanship of Prof. John E. Kiker.

Nine lectures were presented on "Special Problems in Suburban Areas" and four lectures were presented on solutions to the problem.

The banquet speaker was M. Allen Pond, chief, Division of Engineering Resources, USPHS, Washington, D. C. Mr. Pond spoke on "The Sanitary Engineer and National Preparedness."

ALKALINITY-NITROGEN RELATIONSHIPS IN SEWAGE TREATMENT

*The Fifth in a Series of Articles**

by

W. W. ECKENFELDER, JR.
Cons. San. Chemist

JOHN W. HOOD
Superintendent

SEWAGE TREATMENT WORKS
RIDGEWOOD, N. J.

AS was discussed in the previous papers of this series, the alkalinity determination and the changes occurring during a biological treatment step are intimately associated with the process changes and treatment results. This paper presents a continuation of this work and an extension of these principles to effluent and stream studies.

The Authors
W. W. Eckenfelder, Jr. John W. Hood

Oxidation by Aeration

In the oxidation of a sewage by plain aeration, the alkalinity will reflect the progressive changes in the substrate particularly with respect to the nitrogenous components as illustrated in Fig. 1. Former work[3] indicated that the alkalinity changes in second-stage oxidation by aeration could be formulated according to the autocatalytic curve.

$$A = (A_o - A)_e - kA_o(t - c)^{(1)}$$

Experiments at Ridgewood and elsewhere indicated that the nitrate formation curve of a sewage during aeration likewise could be formulated according to the autocatalytic curve, and that the rate constants in this formulation are a direct function of the temperature. The time at one-half oxidation for the nitrate curve corresponds to the constant c in Eq. 1 for alkalinity change with respect to time of aeration. (Fig. 2)

These same principles are seen to be applicable when the aeration is conducted with activated sludge which will perform the oxidation of the carbonaceous and the nitrogenous constituents. Fig. 3 illustrates the progressive oxidation of a raw sewage with 1000 ppm. of activated sludge present. The general characteristics of the curve are similar to those obtained by plain aeration but in a more accelerated phase. Complete oxidation was attained in approximately 1/7 the time required without activated sludge. The sludge used was a nitrifying sludge (i.e. contained appreciable nitrifying organisms) so that nitrification was observed to start almost immediately.

In conventional practice, however, in some cases there is little or no alkalinity reduction through the aerator and in these cases generally no nitrification in the aerator. The subsequent oxidation of this type of sludge by prolonged aeration resulted in an initial increase in the alkalinity with a corresponding increase in the ammonia, this prob-

*Other articles in this series appeared in March, May, June and September.

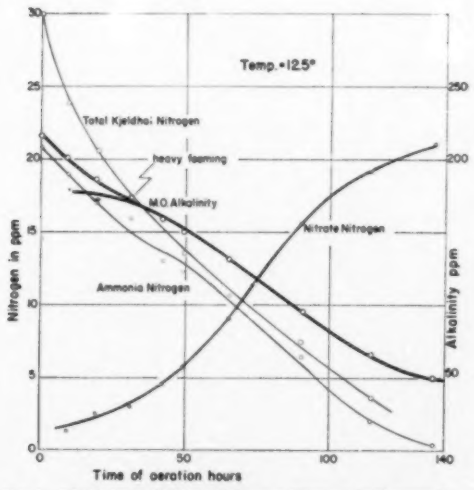


Fig. 1—Alkalinity and Related Nitrogen Changes in Sewage Oxidized by Progressive Aeration

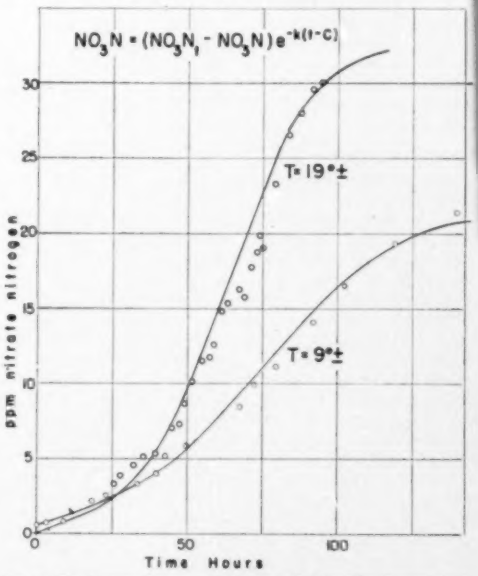


Fig. 2—Nitrification Curves of a Sewage Oxidized by Progressive Aeration

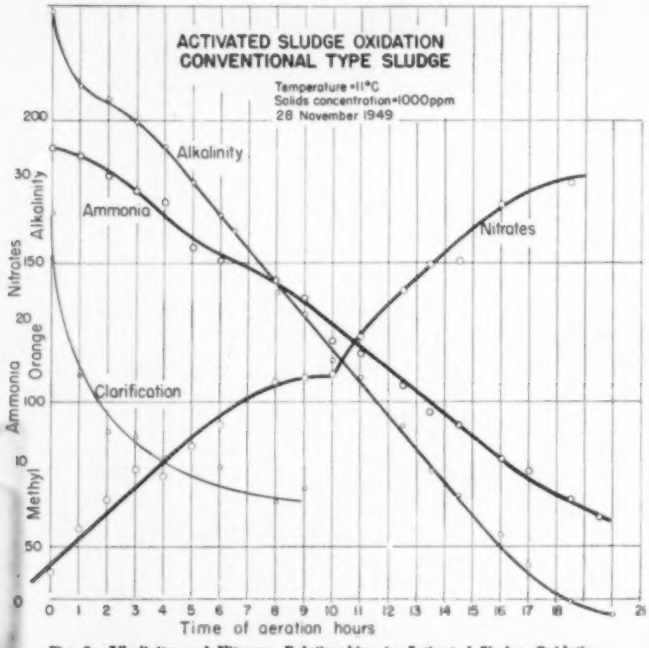


Fig. 3—Alkalinity and Nitrogen Relationships in Activated Sludge Oxidation

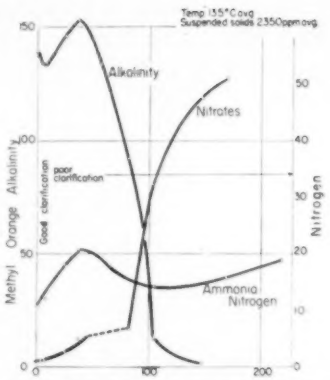


Fig. 4—Alkalinity and Nitrogen Relationships in Sludge Oxidized by Continuous Aeration

ably being due to the hydrolysis of organic nitrogen to an ammoniacal form. Following this there was a rapid fall in alkalinity as the ammonia produced was oxidized to nitrates. This prolonged aeration yielded up to 40-60 ppm. of nitrates in the sludge liquor with alkalinities of from 5-15 ppm. from an initial value of 250 ppm. Overaeration of the sludge to produce this complete oxidation resulted in a dispersion of the sludge floc and a turbid effluent. (Fig. 4)

Nitrogen Changes

The nitrogen changes in activated sludge were observed by Heukelekian[3] to be, the quantitative conversion of ammonia to nitrate, bacterial assimilation of some ammonia, and liberation into the liquor of some of the nitrogen as ammonia with periods of overaeration, with subsequent conversion to nitrates. These changes were confirmed in the work reported here and correlated to the changes in the alkalinity and nitrogen of the liquor of a nitrifying and a non-nitrifying sludge which is aerated and oxidized.

Ammonia adsorption (and the resulting alkalinity reduction) was found by Corbet and Wooldridge[4] to be greatest shortly after the addition of a fresh sewage, this decreasing as the treatment progresses. The actual amount adsorbed at any time is small, however, and the observed reduction in alkalinity due to ammonia adsorption is small. In non-nitrifying sludges the decrease in ammonia and alkalinity may be accounted for in an increase in the organic nitrogen content. With a nitrifying sludge the observed alkalinity decrease is greater since a large proportion of the ammonia is converted to nitrate with intermediate formation of nitrite and hyponitrite. When an excess of carbonaceous material is present, the alkalinity decrease through oxidation is less, the decrease being due to the ammonia utilized to form insoluble nitrogenous components in the sludge and the transformations in the carbon involving base to acid changes.

Studies on Effluents

The effluent from a sewage treatment process will continue to be

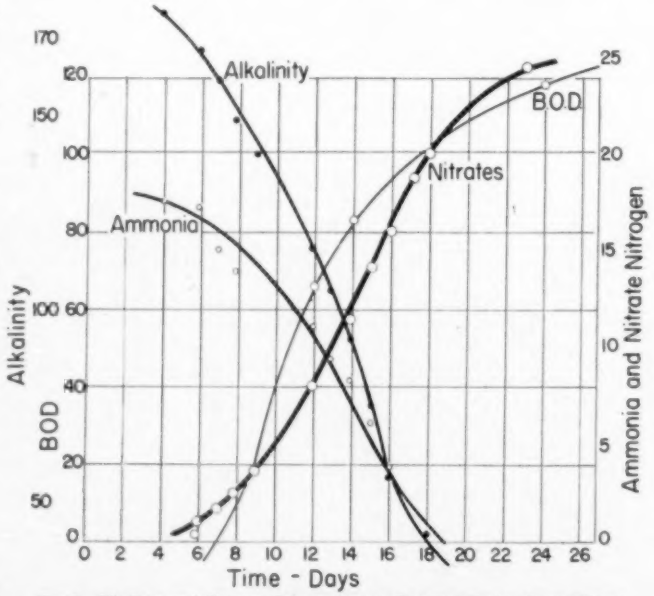


Fig. 5—Alkalinity and Nitrogen Relationships in Activated Sludge Plant Effluent

acted upon biologically, either in the receiving water or in a vessel upon standing. Investigations of the changes in activated sludge plant effluent upon standing indicated that the alkalinity changes were related to the changes in the nitrogenous components and were reflected in the second-stage B.O.D. curve. Fig. 5 represents the oxidation curve of an effluent allowed to stand for 26 days. B.O.D.'s were incubated for a 26-day period and the oxygen demand satisfied determined at time increments. It will be noted from Fig. 5 that a time lag of several days was existent before active nitrification occurred, both from a standpoint of alkalinity change, nitrate formation, and the B.O.D. curve. Recent work of Buswell[4] et al indicates that a significant lag period may at times be present before active nitrification can occur.

Studies of oxidation of sewage effluents revealed an excellent correlation with plan aeration studies. The mathematical formulation of the respective curves obtained were in excellent agreement, the constants in the former case being derived in terms of days of oxidation as compared to hours of oxidation for the latter.

Stream Studies

These findings may be extended to stream studies and in many cases direct and valuable conclusions may be drawn from the changes in the alkalinity. The alkalinity changes in a stream will be caused by carbon dioxide utlization and reduction of bicarbonates to carbonates by green plants (this reaction will also change the reaction or pH of the medium) and by the transformations of the nitrogenous constituents in the water. A sewage effluent will often have a relatively large amount of ammonia present (yielding a relatively high alkalinity) which will be progressively oxidized to the nitrate form. This will be indicated by a reduction in the alkalinity proportional to the oxidation accomplished. The temperature effect in streams is reflected by a lesser reduction in alkalinity in cold weather as compared to warmer weather induced by the reduced biological activity.

The nitrate content in the stream will be reduced by assimilation causing an increase in the alkalinity. This is probably due to the transformation of alkali nitrates to the carbonate or bicarbonate form. This was observed to occur in the Ridgewood experiments when after reaching a minimal alkalinity of 40 ppm. and a maximum nitrate content of 27 ppm., the alkalinity rose as high as 80 ppm. and the nitrate content was reduced proportionately.

Whipple[6] has indicated the use of nitrogen content and changes to judge the fertility of natural waters. Likewise, alkalinity related to nitrogen changes may be used to advantage.

Fig. 6 and Table 3 represent alkalinity changes and related variables in an unpolluted stream which received a high-rate filter plant effluent. The changes in alkalinity downstream are noted. When the stream samples were allowed to stand in the laboratory, the alkalinity was reduced to values of 12-15 ppm. after several days indicating continuing nitrification.

An investigation was made of the Ho-Ho-Kus Brook which receives the effluent from the Ridgewood Sewage Plant. The effluent contained only 3.5 ppm. of ammonia and

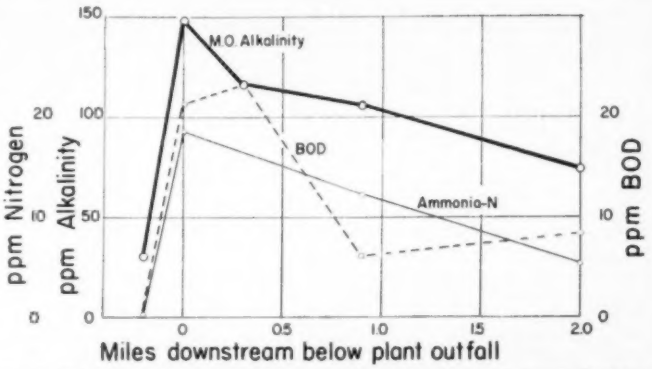


Fig. 6—The Relation Between Alkalinity and Related Variables in a Stream Receiving High-Rate Trickling Filter Effluent

Table 2

ACTIVATED SLUDGE EXPERIMENTAL STUDIES OXIDATION USING SLUDGE AND RAW SEWAGE MIXED: RAW = 84%, SLUDGE = 16% BY VOLUME

Hrs.	Alk. ppm.	Trans. %	pH	O.C. ppm.	Solids ppm.	D.O. ppm.	NH_3-N ppm.	NO_3-N ppm.	T°C
0*	262	66.5	7.8	67		0	37.1		13.5
0**	28	97.0	6.72				1.5	26.0	8.3
0***	238	65.0	7.61	68.5		3.8	32.0	2.2	
1	212	87.0	7.61	40.0	1094	5.95	31.5	5.2	12
2	207	92.0	7.48	30.0		6.5	30.0	7.2	11.5
3	199	92.0	7.50	29.0	980	7.5	20.0	9.3	
4	191	92.5	7.46	25.5		7.75	28.2	8.8	11.7
5	178	93.0	7.28	26.0		7.90	25.0	10.9	11.5
6	166	94.5	7.31	24.0		7.45	24.2	12.5	11.0
6.5	161		7.20						
8	139	95	7.38	17.7		8.55	22.8	15.5	11.0
9	132	95	7.28	20.0		8.85	21.5	15.8	10.4
10	115		7.28		1065				
11	109		7.21			8.6	17.5	18.7	10.0
12.5	92		7.25			9.0	15.3	22.0	10.0
13.5	76		7.14			9.1	13.4	23.8	
14.5	68		6.98			9.2	12.6	24.1	10.0
16.0	54		6.84			9.2	10.0	28.0	
17.0	43		6.8				9.4	29.2	10.7
18.5	36		6.52				7.3	29.7	20
19.5	26		6.58				6.0		20

* Raw Sludge
** Return Sludge Liquor
*** Mixture

Table 1

AERATION STUDY ON FLUME

Hours	pH	Alk.	T-K-N*	NH_3-N	NO_2-N	NO_3-N	Trans.**	T°C	Remarks
0	7.70	216	30.0	20.8	.....	trace	47%	.....	
9	8.05	201	23.9	19.0	.....	1.3	61.5	12	some foam
19	8.10	187	20.6	17.0	0.56	2.5	75.0	13	heavy floc
31	8.00	173	.....	16.0	.....	3.0	78.0	12.9	heavy foaming floc heavy foam
42	8.05	158	14.0	13.0	.....	4.6	85.0	12.5	some foaming
49	.....	150	13.65	12.3	0.50	5.7	.....	13.5	very little foaming
65	7.7	131	.....	10.8	0.86	9.1	clear	.....	some foaming crystal clear
90.5	.....	96	7.4	6.4	.....	15.6	clear	12.5	slight foaming
114.5	.....	66	3.6	2.0	.....	19.8	pin floc clear	11.8	practically no foaming
136.0	.....	50	.....	0.4	.....	21.8	clear	10.9	practically no foaming

* Total Kjeldahl Nitrogen
** Transmittency

Table 3

STUDIES ON UNPOLLUTED STREAM RECEIVING HIGH-RATE FILTER EFFLUENT

Sample	ppm. Turbidity	pH	M.O.A. Alk.	Relative Stability	NH_3-N	NO^2-N	D.O.	5-day B.O.D.
Above Plant Discharge	3.20	8.0	30	100%	0	0	3.4	0
50 ft. Below Plant Discharge	15.50	7.24	148	47%	18.5	0.20	5.3	21.2
0.3 Miles Below	13.50	7.25	116	47%	.....	0.73	5.8	23.6
0.9 Miles Below	5.50	7.33	106	90%	12.3	0.72	4.7	6.0
2.0 Miles Below	4.20	7.40	74	90%	5.4	0.70	3.9	8.3

6 ppm. of B.O.D. Only very slight alkalinity changes in the stream were noted here as a result of the highly purified effluent as compared to the high-rate filter effluent.

Another stream investigated, which was composed of two branches which joined and flowed through a populated community, revealed the correlation between alkalinity changes and nitrogen and metabolic changes. These data are illustrated in Table 4. In general, in a stream receiving sewage plant effluent but not industrial wastes the alkalinity will be contributed by mineral salts (bicarbonates, carbonates) of calcium, magnesium, sodium, and potassium, and by ammonia salts and derivatives.

With respect to time in the stream the alkalinity will change due to the carbon dioxide transformations, oxidation of basic ammonium compounds to nitrites and nitrates and then due to the use of nitrate by the organisms. Since soluble forms of nitrogen are the only ones readily available to the synthetic organisms, nitrate being directly available and other forms by oxidation, the organism activities will be reflected in the alkalinity changes. Caution must be exercised, however, in the direct interpretation of these changes due to the many complex reactions occurring simultaneously.

Recent work on the addition of sodium nitrate to river waters[6] indicate a possible further use of alkalinity change as an index of stream changes. The biological changes in a stream were investigated by Patrick[7] in terms of the Biodynamic Cycle. Certain aspects of this cycle are reflected in a continuously changing alkalinity induced by biological activity. Bartsch[8] in his investigation of stream pollution has indicated the importance of the "mineralizing" process.

Summary and Conclusion

The alkalinity determination may be used as a measure of oxidation efficiency in the activated sludge process under certain conditions. In the case of a nitrifying sludge the alkalinity will be reduced due to ammonia oxidation, base to acid changes, and ammonia assimilation. A non-nitrifying sludge will produce little or no alkalinity reduction (only due to nitrogen assimilation and adsorption) unless it is further oxidized in which case advance nitrification will produce rapid alkalinity reduction.

Alkalinity changes may be used in effluent and stream study in some cases to observe the biochemical changes in the stream. This application is limited by the chemical content of the waters and the need for proper interpretation of the data.

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Table 4

STUDIES ON BRANCHED STREAM

	pH	Alk. ppm.	Organic Nitrogen ppm.	Ammonia ppm.	Nitrates ppm.	B.O.D. ppm.	D.O. ppm.
East branch	8.0	80	6.7	2.0	3.4	18	5.05
West branch	7.7	194	6.8	12.0	13.2	22	3.35
500 ft. below junction	7.85	106	6.2	3.6	4.1	15	3.55
2500 ft. below junction	7.97	126	5.9	6.7	2.5	12	2.40
3100 ft. below junction	8.05	130	7.2	12.3	3.0	17	2.30

Cincinnati Sewage Works Bids Received

Construction of the Cincinnati sewage treatment plant will start soon. Bids were received on Oct. 3.

Action of the Cincinnati authorities to start construction of their treatment works has been vigorously advanced during the past two years. While designs were being made the city started collection of a sewer tax to aid in financing construction. More than $3,500,000 is already in the fund. City Engineer T. J. Montgomery, has estimated that it will take about eighteen months to complete the disposal unit. The plant will treat 28 million gallons daily of raw sewage now discharged directly into the river. Meantime, the city is working on preliminary plans for the second and largest unit in its treatment system, which will handle 110 million gallons daily of sewage and industrial wastes. The firm of Havens and Emerson, Cleveland, are consultants to the city on the work.

Indiana Water Conservation Conference Held

The status of Indiana's ground water resources was considered at the first Indiana Water Conservation Conference held at Purdue University on November 28 and 29. This first conference of interested groups was limited to the problems of ground water conservation.

Organizations participating in the conference represented industry, education, government, and various professional groups interested in the problems of conserving water resources.

On the first day the attention of the conference was directed to a consideration of the present situation in Indiana with regard to ground water and the demands of domestic, industrial, and agricultural users. Geological and meteorological factors affecting water supply will be covered in the discussions.

Specific topics covered a review of current ground water investigations, a discussion of a federal water resources policy, the effect of population trends on domestic water usage, and the effects of excessive runoff and cyclic rainfall.

The conditions to be faced as a result of present and future water requirements, and conservation methods designed to help meet the problems of increased demand were given consideration on the second day. These discussions covered runoff control, water spreading, legal controls, pollution control, the water requirements of air conditioning equipment, and the reduction of wastage.

A SYSTEM OF BALANCING OXIDATION-REDUCTION EQUATIONS

by

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The Author

MORE and more attention is being given to the field of chemistry by the sanitary engineer of today. One of the problems that is being encountered is that of chemical oxidation-reduction processes and subsequent balancing of the chemical equations involved.

In most cases where the actual balancing of oxidation-reduction reactions* is required, the sanitary engineer generally consults a standard chemical text for the method or seeks outside assistance. This article will outline a very convenient and simple method of balancing any type of oxidation-reduction equation. This method is not found in most of the standard texts; it is developed in a systematic way and will permit the balancing of any equation to proceed in an automatic manner.

Problems Encountered

Some typical examples of problems encountered in the field of sanitary engineering include routine water and sewage analysis.

(1) Determination of calcium.

$$8\ H_2SO_4 + 2\ KMnO_4 + 5\ CaC_2O_4 \rightarrow 10\ CO_2 + 2\ MnSO_4 + 8\ H_2O + K_2SO_4 + 5\ CaSO_4$$

(2) Determintion of potassium.

$$5\ K_2NaCo(NO_2)_6 + 11\ MnO_4^- + 28\ H^+ \rightarrow 5\ Co^{+3} + 11\ Mn^{+2} + 30\ NO_3^- + 14\ H_2O + 2K^+ + Na^+$$

(3) Rideal-Stewart modification of Winkler method of D.O. determination.

$$Mn(SO_4)_2 + 2\ KI \rightarrow MnSO_4 + K_2SO_4 + I_2$$
$$I_2 + 2\ S_2O_3^{=} \rightarrow S_4O_6^{=} + 2\ I^-$$

Industrial waste treatment processes necessitate a working knowledge of oxidation-reduction reaction. One example is found in the treatment of waste water containing cyanides from electro-plating processes. The addition of chlorine to the waste water yields a non-toxic effluent containing no cyanide.

$$CN^- + Cl_2 + H_2O + 2\ OH^- \rightarrow 2\ Cl^- + CO_3^{=} + NH_4^+$$

Sanitary engineers also run into oxidation-reduction problems of a biologic nature. For example, the oxidation of alcohol found in cannery wastes, which if carried out anaerobically by Methanobacteria, may be summarized in the following equation:

$$2\ CH_3CH_2OH + CO_2 = 2\ CH_3COOH + CH_4$$

Another example found in course of sewage treatment is the process whereby microorganisms such as E. coli reduce nitrate to nitrite.

$$HCOOH + HNO_3 \rightarrow CO_2 + H_2O + HNO_2$$

Half React in Balancing Method

The half reaction method of balancing oxidation-reduction equations is the method proposed. An example will best demonstrate the method.

Consider the oxidation of sugar to carbon dioxide by dichromate solution (standard laboratory cleaning solution).

$$C_6H_{12}O_6 + Cr_2O_7^{=} = CO_2 + Cr^{+++}$$

It should be noted that this method as well as all other methods requires a knowledge of the end products of the reaction—in this instance the end products are CO_2 and Cr^{+++}. It is necessary after the initial problem is established to separate it into two so-called "half-reactions." This is fairly simple by matching the pairs that logically belong together.

$$C_6H_{12}O_6 \rightarrow CO_2$$
$$Cr_2O_7^{=} \rightarrow Cr^{+++}$$

The procedure is purely mechanical from this point on and proceeds by the following steps.

STEP 1. Balance the atoms that are fundamentally involved in the reaction. In the example cited, it is the carbon atom in one half reaction and the chromium in the other.

$$C_6H_{12}O_6 \rightarrow 6\ CO_2$$
$$\text{6 carbons} \qquad \text{6 carbons}$$

$$Cr_2O_7^{=} \rightarrow 2\ Cr^{+++}$$
$$\text{2 chromiums} \qquad \text{2 chromiums}$$

STEP 2. Balance the oxygen on both sides of the equation using H_2O.

$$6\ H_2O + C_6H_{12}O_6 \rightarrow 6\ CO_2$$
$$\text{6 oxygen} \quad \text{6 oxygen} \quad \text{12 oxygen}$$

$$Cr_2O_7^{=} \rightarrow 2\ Cr^{+++} + 7\ H_2O$$
$$\text{7 oxygen} \qquad \text{7 oxygen}$$

STEP 3. Balance the hydrogen on both sides of the equation using H

$$6\ H_2O + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 24\ H$$
$$\text{12 hydrogen} \quad \text{12 hydrogen} \quad \text{24 hydrogen}$$

$$14\ H^+ + Cr_2O_7^{=} \rightarrow 2\ Cr^{+++} + 7\ H_2O$$
$$\text{14 hydrogen} \qquad \text{14 hydrogen}$$

STEP 4. Balance the charges appearing on both sides of the equation by using electrons e^-, which each carry one negative charge.

$$6\ H_2O + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 24\ H^+ + 24\ e^-$$
$$\text{0 charges} \qquad \underbrace{\text{24}^+ \text{ charges} \quad \text{24}^- \text{ charges}}_{\text{0 charges}}$$

$$\underbrace{6\ e^-}_{6^-\text{ charges,}} + \underbrace{14\ H^+}_{14^+\text{ charges}} + \underbrace{Cr_2O_7^{=}}_{2^-\text{ charges}} \rightarrow \underbrace{2\ Cr^{+++}}_{6^+\text{ charges}} + 7\ H_2O$$
$$\underbrace{\qquad\qquad\qquad\qquad}_{6^+\text{ charges}}$$

It might be interesting to stop at this point where both half reactions are now balanced and point out a significant fact. The gram equivalent weight (g. eq. wt.) of a substance involved can be obtained by dividing the gram molecular weight (g. mol. wt.) by the number of electrons involved in the half reaction.

$$C_6H_{12}O_6 \text{ ——} \frac{180\text{ g. mol. wt.}}{24e^-} = 7.5\text{ g. eq. wt.}$$

Oxidation Potentials, W. M. Latimer, Prentice Hall, 1938.

$$Na_2Cr_2O_7 \text{ —— } \frac{262 \text{ g.mol. wt.}}{6e^-} = 43.7 \text{ g. eq. wt.}$$

STEP 5. To arrive at the balanced equation it is necessary to treat the two half reactions simultaneously as algebraic equations, eliminating the electrons algebraically.

$$4\ (6\ e^- + 14\ H^+ + Cr_2O_7^= \rightarrow 2\ Cr^{+++} + 7\ H_2O)$$

Note that 24 e^- now appear in both half reactions.

$$24\ e^- + 56\ H^+ + 4\ Cr_2O_7^= \rightarrow 7\ Cr^{+++} + 24\ H_2O$$

$$6\ H_2O + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 24\ H^+ + 24\ e^-$$

By adding these two equations algebraically we obtain:

$$24\ e^- + 56\ H^+ + 4\ Cr_2O_7^= + 6\ H_2O + C_6H_{12}O_6 \rightarrow$$
$$8\ Cr^{+++} + 28\ H_2O + 6\ CO_2 + 24\ H^+ + 24\ e^-$$

Now cancel the electrons, H^+, and H_2O on one side against the other and the balanced equation is:

$$32\ H^+ + 4\ Cr_2O_7^= + C_6H_{12}O_6 \rightarrow 8\ Cr^{+++} + 22\ H_2O + 6\ CO_2$$

In Basic Solution

It is necessary to balance some equations in a basic solution rather than in an acid solution. For example, the problem:

$$C_6H_{12}O_6 + CrO_4^= \rightarrow OH^- + CO_3 + Cr(OH)_3$$

Procedure: Carry the equation through steps 1 to 5 inclusive. This results in the balanced equation in an acid solution.

$$8\ CrO_4^= + 16H^+ + C_6H_{12}O_6 \rightarrow 8\ Cr(OH)_3 + 6\ CO_2 + 2\ H_2O$$

STEP 6. For each H^+ ion showing add an equivalent number of OH^- ion to both sides of the equation.

$$8\ CrO_4^= + 16\ H^+ + C_6H_{12}O_6 \rightarrow 8\ Cr(OH)_3 + 6\ CO_2 + 2\ H_2O$$
$$+ 16\ OH^- \qquad\qquad + 16\ OH^-$$

By adding these two equations algebraically we obtain:

$$8\ CrO_4^= + 16\ H_2O + C_6H_{12}O_6 \rightarrow$$
$$8\ Cr(OH)_3 + 6\ CO_2 + 2\ H_2O + 16\ OH^-$$

Canceling out the appropriate number of H_2O molecules on each side of the equation results in the balanced equation in a basic solution.

$$8\ CrO_4^= + 14\ H_2O + C_6H_{12}O_6 \rightarrow 8\ Cr(OH)_3 + 6\ CO_2 + 16\ OH^-$$

Summary

To balance redox reactions by half reaction method.
(1) Balance principal atoms involved.
(2) Balance oxygen with H_2O.
(3) Balance hydrogen with H^+.
(4) Balance charges shown with e^-.
(5) Eliminate e^- between two half reactions by algebraic treatment.

Faust to Become Exec. Ass't. Secy. of A.W.W.A.

To Assume Duties About Jan. 1, 1951

By action of the Board of Directors of the American Water Works Association, Mr. Raymond J. Faust of Lansing, Mich., has been appointed Executive Assistant Secretary of the American Water Works Association, effective on or about January 1, 1951.

"Ray" Faust

Mr. Faust at the present time is Chief of the Water Supply Section, Division of Engineering, Michigan Department of Health. He was born in Millersburg, Pa., September 16, 1901. He was graduated from Pennsylvania State College with the degree of B.S. in Sanitary Engineering in 1923 and received his C.E. from the same institution in 1935.

From the time of his graduation in 1923, Mr. Faust has been in the continuous employ of the Michigan Department of Health, Division of Engineering. His duties covered the entire gamut of public health engineering in the water and sewage fields. In recent years his duties have been confined principally to water supply. His earlier routine field activities have been replaced by administrative responsibilities and contacts with municipal officials in relation to water supply improvements.

Mr. Faust is at present a member of the Board of Directors of the American Water Works Association representing the Michigan Section. He joined the Association in January 1938 and has been active in the affairs of the Section since that time, serving the Section as trustee 1939-41 and as Secretary-Treasurer from 1944 until the time of his election as Director in 1949. He received the Fuller Award in 1946.

Mr. Faust is a registered professional engineer in Michigan and is a member of the American Public Health Association and the Lansing Engineers Club.

Sodium Fluoride in Ice Cubes*

The fact that some mineral salts are concentrated in ice block "cores" during the manufacture of ice raised the question of what happened to sodium fluoride in ice cubes in the household refrigerator. Would children sucking these ice cubes or drinking iced drinks be subjected to almost negligible concentration of NAF at one time with possible very high concentrates at a later period as the centre of the cubes become liquid?

The writer took a sample of water from a tap in the distribution system, filling a cube tray with one portion and a sample bottle with the remainder. The tray was placed in the refrigerator which was so adjusted that slow freezing would take place to give every possible chance of NAF concentration in the centre of the cubes. Finally after the cubes had been frozen 24 hours they were removed from the tray and placed all together in a cluster in a large glass funnel which was supported so that samples could be progressively collected as the cubes melted.

The ice cubes were permitted to melt slowly at room temperature. It was noticed that they maintained shape much better than expected so that the later samples collected fairly well represent the centre of the cubes. 100 ml. samples of the resulting water were collected in Nessler tubes and were analyzed for fluorine colorimetrically according to the 9th Ed. of "Standard Methods for the Examination of Water & Sewage." The results of the analyses are shown in the accompanying table.

	ppm. as F
1st 100 ml	0.80
2nd 100 ml	1.05
3rd 100 ml	1.70
4th 100 ml	1.65
5th 100 ml	1.25
6th 100 ml	0.75
7th 100 ml	0.50
Average	1.10

The average of all figures from the samples collected during progressive melting agrees very closely with the fluoride content of the original unfrozen sample which was 1.15 p.p.m. fluoride as F.

There apparently is not a uniform distribution of fluoride in ice cubes. The writer does suggest that while a difference in concentration of fluoride in ice cubes does exist it does not appear to be of a magnitude sufficient to warrant undue alarm.

*A contribution from D. B. Williams, Chemist, Water Works Laboratory, Brantford, Ont.

EQUILIBRIUM PERCOLATION TEST

For Designing Sewage Effluent Leaching Fields

by

H. F. Ludwig, W. D. Ward, W. T. O'Leary, and E. Pearl*

UNIVERSITY OF CALIFORNIA

IN a previous discussion [1], an "equilibrium method" was described for making soil percolation tests. That method differs from the conventional procedure in the manner in which the field data are recorded, analyzed, and interpreted. It was noted that the rate of percolation changes during the progress of the test, approximating a hyperbolic variation, as shown by Fig. 1A. The percolation rate, R, in minutes per inch, decreases with increase in the elapsed time, t, and gradually approaches a maximum or asymptotic value, k. The test is conducted by repeatedly refilling the test hole to a given level, at some constant interval, $\triangle t$, with the observer noting the drop, $\triangle d$, in the water level occurring during each interval.

The value of R, representing the average rate of drop at any time t, will equal the rate of change of t with respect to d, and therefore may be approximated by determining the ratio $(\triangle t)/(\triangle d)$ where $\triangle t$ begins just prior to time t and ends shortly thereafter. If such values of R are plotted against values for the accumulated time, t, the actual percolation hyperbola, Fig. 1B, is obtained. Instead, however, the data are first transposed by simple computation, so that values of (t/R) are plotted against (t). This device yields the straight line, shown in Fig. 1B, which is the mathematical equivalent of Fig. 1A. The advantage of doing this, is that the slope of the straight line, which can be readily scaled off the plot, equals the value k. The reciprocal of the slope equals the maximum value of R, namely, the value which R would attain were the test to be continued for a prolonged time. Thus is obtained a definite physical property of the soil, its equilibrium leaching rate. It is noted also, since a straight line can be established by the plotting of only a few points, that the slope or equilibrium value can be determined with the data obtained from a short testing period. It is not necessary for the observer to wait in the field until, in his judgment, a near-equilibrium has been obtained. Instead, the procedure is mechanical; the observer records the test data, and he—or anyone else—can determine the equilibrium value by graphical plotting at the office. All of the field data contribute to the final result, and the effect of errors in individual measurements is minimized. Table I illustrates data for a typical test, including the field measurements and the necessary computations.

In practice, it is more convenient to employ the slope value, k, instead of the 1/k value, because the former represents the equilibrium percolation rate in inches per minute, instead of in minutes per inch. The k value multiplied by 900 converts the equilibrium rate from inches per minute to gallons per square foot per day (gsfd.). This value is next multiplied by a factor of 1/20, or fice per cent, to convert k to a sewage effluent leaching rate, G, usable for design; hence $G = 0.05\ (900k) = 45\ k$.

In other words, it is assumed that under the conditions obtaining in most septic tank effluent leaching systems, the leaching area can be depended upon to dispose of sewage effluent at an average rate equal to five per cent of the water equilibrium rate. This is an overall conversion factor and takes into account such factors as transpiration and the difference in measuring the effective leaching area under test and design conditions. (In the percolation test, only bottom area is considered; in design, both bottom area and side area may be considered effective [2].)

During the past several months, percolation tests have been made [3] at six different sites of varying soil types, located in Santa Clara County of California. The sites were selected only at places where the soil strata appeared to be uniform over a considerable area, so that two different equilibrium tests conducted at two different test holes within the area would give practically the same results. Both the equilibrium and conventional percolation methods were employed and an improved technique developed for the equilibrium method. The remainder of this discussion describes the results obtained.

Comparison with Conventional Method:

Table II presents the values of k obtained at the six selected sites by the equilibrium method, and the equivalent design figures in gsfd. units. While conducting the equilibrium method tests, additional measurements were made to determine the time required for the accumulated drop to pass from six inches to seven inches, i.e., to obtain a measurement equivalent to that obtained when the conventional method [1] is employed. All measurements were checked by repeating the

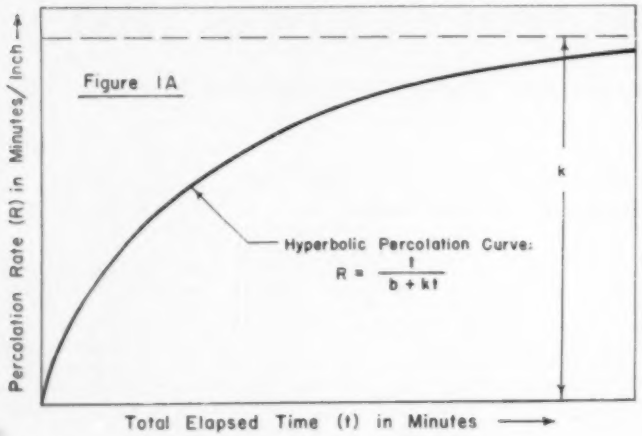
Table I

EXAMPLE OF DATA SHEET FOR PERCOLATION TEST BY EQUILIBRIUM METHOD

Time of Reading	D_1 (inches)	D_2 (inches)	d (inches)	R= t/d	t R	t (min.)
11:30		9.98				
			8.94	3.36	4.46	15
12:00	18.92	9.13				
			4.79	6.26	7.20	45
12:30	13.92	9.00				
			3.80	7.90	9.50	75
13:00	12.80	9.00				
			3.35	8.96	11.70	105
13:30	12.35	9.00				
			3.25	9.23	14.65	135
14:00	12.25	9.00				
			3.11	9.65	17.10	165
14:30	12.95	9.00				

Notes: t = 30 min.
D_2 = vertical distance from reference point to water level immediately after each filling
D_1 = vertical distance from reference point to water level at end of time interval
k = 0.82, scaled from straight-line curve fitted to plot of (t/R) as ordinates versus (t) as abscissas. Design loading rate = 0.082 x 45 = 3.68 gsfd.

* Respectively (1) Associate Professor of Sanitary Engineering, University of California, Berkeley; (2 and 3) Civil Engineering Students of Santa Clara University, Santa Clara, California; and (4) Public Health Engineer and Director of Sanitation, Santa Clara County Health Dept., San Jose, California.



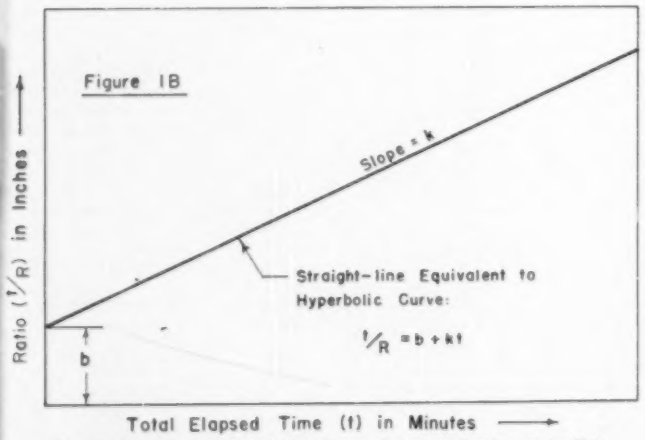


Fig. 1—Hyperbolic and Straight-Line Representations of Soil Percolation Rate

work at another test hole located nearby (about 20 feet distant). The allowable design figures for sewage effluents based on the seventh-inch time measurements were determined in the manner prescribed for the conventional method, and these data are also recorded in Table II.

Comparison of the design or G-values of Table II demonstrates that the two methods give design results of the same magnitude. A plot of the two sets of data (not shown) indicates that for soils having allowable design rates up to about 3 gsfd., the two methods give approximately equal results, but that for more porous soils, the equilibrium method allows greater design loadings. This is in accord with observations made by the writers and others [3] that really porous strata can usually percolate away much more sewage effluent than indicated by the conventional method. For example, there are numerous instances where a simple cesspool or pit constructed in porous soil has operated satisfactorily as both septic tank and leaching system.

Table II

Design Percolation Rates for Sewage Effluents as Determined by the Equilibrium and Conventional Methods

Site No.	Equilibrium Method[2] k, in./min.	G, gsfd	Conventional Method[2] 7th-inch time, min.	G, gsfd
A	0.022	0.99	12.5	1.5
B	0.026	1.17	14.5	1.4
C	0.053	2.38	15.0	1.35
D	0.104	4.69	0.5	4.75
E	0.108	4.86	5.2	2.1
F	0.156	7.02	1.3	3.9

Recommended Time Interval for Equilibrium Method:

In making a percolation test by the equilibrium method, the head of water in the test hole is not constant. Instead, the head decreases from a maximum of 12 inches at the beginning of each test cycle to a minimum at the end of that cycle, at which time the hole is refilled to its original level. By keeping the time interval, $\triangle t$, sufficiently small, the effect of varying head may be minimized to become negligible, and the resulting value of k will be practically the same as if a constant head of 12 inches had been maintained throughout the test. Conversely, if the time interval selected is too large, the resulting value of k will be too small and result in overdesign of the leaching system. This effect may be illustrated by changing the value of $\triangle t$ during the progress of a percolation test. Fig. 2 illustrates results for such a test made in a loam soil, in which the value of $\triangle t$ was initially selected at 6 minutes, then changed successively to 12, 24, and 48 minutes. It is noted that the values of k_6 and k_{12} are the same, but k_{24} is less than k_{12} and k_{48} less than k_{24}.

The proper or maximum permissible value of $\triangle t$ will be different for different soils, being smaller for coarse soils and larger for more impermeable ones. Studies of the type shown in Fig. 2 were made at three of the six test locations, to determine their proper $\triangle t$ values. It was observed that the proper $\triangle t$ value at each site equalled approximately the time required for the water level to drop a total of four inches after beginning the test. These results are not sufficient to be conclusive, but they indicate that in practice the maximum allowable $\triangle t$ value for any site may be estimated simply by noting the time required for the water level to drop approximately four inches after beginning the test. For many soils of relatively low permeability, the maximum allowable $\triangle t$ value given by this method will be too large for practical use, and it will be more convenient to select arbitrarily a smaller interval such as 30, 40, or 60 minutes.

Time Required for Making Percolation Tests:

The period of time which the observer must remain in the field to complete an equilibrium test will be only a few hours, enough to establish the slope of the (t/R) versus

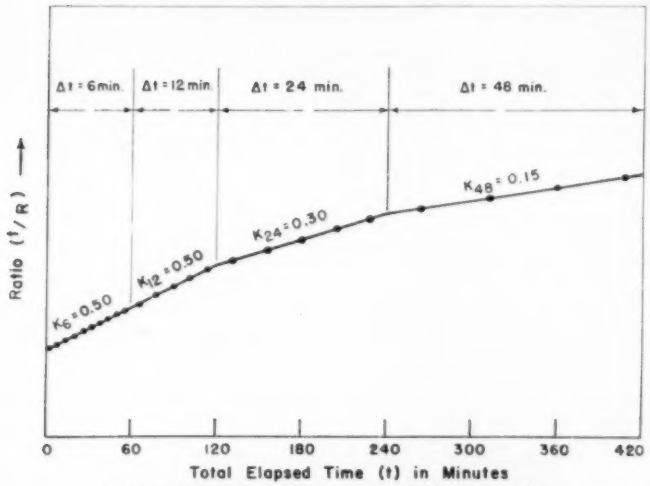


Fig. 2—Changes in Equilibrium Slope with Changes in (△t)

(t) plot, provided it is known that impermeable strata are not present beneath the site which might affect the rate of leaching were the test to be prolonged. If such information is lacking, it may be advantageous to continue the test for a longer period, such as 6 to 8 hours. If a less-permeable stratum is present at some depth close enough to be significant, its effect will be made apparent when value of (t/R) are plotted against (t). The plot will show a discontinuity in slope, i.e., an initial straight line of a certain slope will be established, and then this will change to some lesser slope as the lower stratum begins to affect the percolation rate. In places where this occurs, it is recommended that the data be studied to note the time when the effect of the lower stratum becomes apparent, and that only the data obtained subsequent to this time be considered in evaluating k.

The choice of 6 to 8 hours as a suitable period for tests conducted to detect lower less-permeable strata is based on the assumption that if the effect of a lower stratum does not show up in this time, then it will not be pertinent to the design problem. This assumption is considered justified because the actual application of septic tank effluents to leaching fields is or should be intermittent rather than continuous, so that sustained loadings lasting for periods much longer than 6 or 8 hours will probably not occur except occasionally.*

Prolonged Percolation Tests:

It is believed that little added information of design value can be obtained by continuing the percolation test for very long periods, such as several days. As has been shown by Allison [6], the "equilibrium" percolation rate of a soil undergoing such prolonged continuous submergence gradually changes, in the manner indicated by Fig. 3. At first there occurs a gradual decrease in permeability (Zone A), due probably to swelling and dispersion of the dry soil upon wetting and also to dispersion caused by leaching away of soluble salts. This initial period, which may last from 1 to 20 days, is followed by an increase in permeability (Zone B), due to removal of entrapped air. Finally, after the maximum percolation rate is reached, the permeability decreases with further submergence until after 2 to 4 weeks the rate is usually only a fraction of its original value. This decrease appears to be due to clogging of the soil pores by microbial cells or their metabolites, and will be more rapid when greater amounts of organic matter are present. Moreover, as already noted, discontinuance of the submergence and reaeration of the soil may induce soil aggregation and restore the permeability to its original or even a higher value. This effect has also been reported by Pillsbury [3], who notes that organic matter applied to soil can, when it decays, cause a marked improvement in permeability.

All of these data serve to indicate how complex the subject is, and how difficult it will be to devise a really

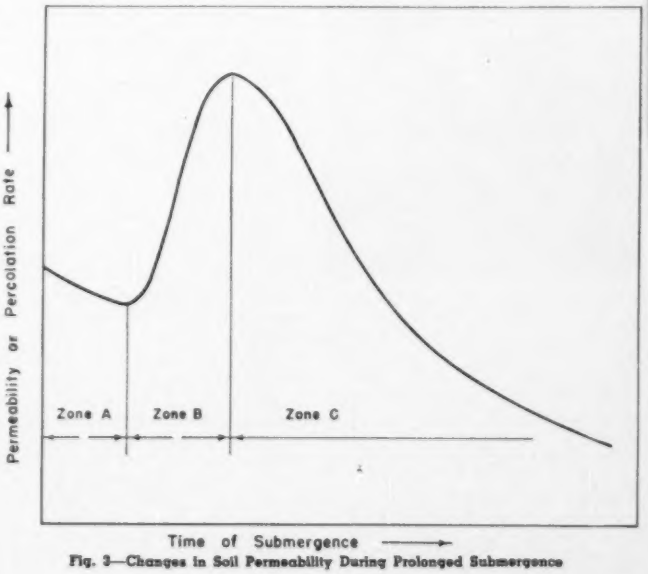


Fig. 3—Changes in Soil Permeability During Prolonged Submergence

* This fact is recognized in practice (5), e.g., at places where effluent is produced continuously throughout the 24 hours of the day, it has been found more economical to employ two or more leaching systems which are alternated in use, rather than a single system used continuously. This principle may possibly be explained by the work of Allison (6), who notes that soils containing organic matter undergo microbiological clogging when they are continuously submerged, but that if such clogged soils are air-dried, sieved, and retested they exhibit an even higher permeability than before clogging occurs. It appears possible that the metabolites produced by microbial activity under conditions of submergence are effective as soil sealing substances only if submergence is continued, and that if the same metabolites are given opportunity to dry, they may act instead to open the soil pores through the process of soil aggregation.

rational test for measuring a soil's capacity for disposing of sewage effluent. The empirical, but simple water percolation test, or some equivalent of it, will probably continue to be the most practical tool for design purposes for a long time to come. It is planned to continue studies of the equilibrium method by making tests at various places having widely different soil characteristics, and also to estimate the soil permeabilities at these same places employing the methods used by soil scientists. One such method is to obtain an undisturbed specimen of the soil with a core sampler of the type described by Uhland [8], and to measure the permeability in the laboratory. Another is to estimate the permeability by expert evaluation of the soil characteristics, as described by O'Neal [4]. Comparison of the various results may suggest improvements by which a soil's capacity for leaching sewage effluents may be estimated with more reliability and less work than is now possible.

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Simple Method for Handling Large Objects*

It isn't difficult to handle materials and objects easily and inexpensively.

This photograph, for example, shows an excellent set-up for handling heavy objects, the object in the picture being a large water meter.

Steel framework over the truck holds an I-Beam rigidly in place overhead, on which a chain hoist rolls. The I-Beam projects back far enough so that after the object is lifted by the hoist and rolled to the extreme end, the object is clear of the truck and may be placed upon any other type of conveyance without any sheer muscular lifting whatever. No skid. No pinch bars. No rollers. Much time is saved. And of course this method is *safer*.

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.

Cyanide Manufactured From Sewage Gas In South Africa

Hydrogen cyanide is obtained when ammonia, methane and air are passed over a catalyst. In the United States the occurrence of natural gas provides a ready supply of methane, but there is no such convenient source of methane in South Africa.

When the process was still in the experimental stage, work on a pilot plant scale, was therefore based on the use of coal gas. Although the pilot plant went into production as long ago as 1937, the numerous problems encountered were not overcome until 1942. From that date the plant ran smoothly until it was closed down at the beginning of 1949 having produced in all more than 6,000 tons of cyanide, expressed as 100% NaCN. The actual form in which the cyanide was delivered to the gold mines was as calcium cyanide solution, the hydrogen cyanide gas being absorbed in a lime slurry and the solution filtered off. In this way a product convenient for transport and handling was obtained.

Since coal gas is an expensive source of methane a search was made, when full scale production was contemplated, for a cheaper source of the gas. Sewage sludge gas from one of the disposal works of the Johannesburg Municipality was tried on the pilot plant. The results were satisfactory, and it was decided to manufacture cyanide at the largest of the city's sewage works—Klipspruit. Although construction was started in 1945 the plant was not completed until February, 1949, mainly on account of post-war difficulties in obtaining supplies. The ammonia required is obtained from a synthesis plant at the Modderfontein factory of A. E. & C. I.* It is transported to the Klipspruit Sewage Treatment Works as liquid ammonia in a specially constructed road tanker.

*From an account furnished by W. A. Barr, Technical Adviser, African Explosives & Chemical Industries, Johannesburg, S.A.

How to Save Valuable Screen Wire*

It is much easier to patch a hole in screens than most people realize. Apply the following simple method which has been used successfully by this writer many times.

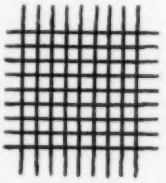

Fig. 1
Strip off wires like this.

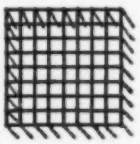

Fig. 2
Then bend like this

Cut off a patch of ample size for covering the hole. Then as indicated in Fig. 1 strip some of the wires from all of the edges. This leaves wires projecting out in all four directions as shown in the sketch. Then bend the ends perfectly square with the plane of the screen as in Fig. 2. Next place the patch over the hole, push the projecting ends through the meshes of the screen being patched and finally clinch the ends over. The patch will hold surprisingly well.

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.

SEWAGE WORKS DESIGN REQUIREMENTS*

Secondary Sewage Treatment: Trickling Filters, Intermittent Sand Filters, Final Settling; and Chemical Precipitation

by
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Consulting Sanitary Engineer
CAMP HILL, PA.

THE first article in this series covered Sewage Collection Systems and Pumping Stations, the second article covered Primary Sewage Treatment including Primary Settling Tanks, Sludge treatment and Chlorination.

This article contains a composite interpretation of the regulations and recommendations in regard to the design of secondary sewage treatment as issued within recent years by several State Boards of Health. Combining this article with the second article containing design requirements for primary treatment, complete treatment will be covered. Eight states have issued their particular requirements in the last three years and ten others in the preceding five years. These requirements have been issued for the purpose of correcting previous faults and for general improvement of new sewage works. They were based upon intimate knowledge and study of many treatment plants under health department jurisdiction. Combining many states, thousands of plants are included and a composite interpretation will represent the most up to date standards in lieu of the fact that there are no general universal standards.

The Author

The Third of a Series of Articles Based on the Current Official Regulations or Recommendations of Health Departments of Various States.

LOW RATE TRICKLING FILTERS

The trickling filter constitutes the most simple type of biological treatment and is by far the most prevalent. It is easy to install, simple to operate, does not require specially skilled supervision, is adaptable to small and large plants for treatment of almost all kinds of sewage.

The so-called "Standard or Low Rate" trickling filter was the original unit. It gives a high degree of treatment, excelled only by activated sludge and intermittent slow sand filters. The "High Rate" trickling filter was introduced later to overcome some of the difficulties of operation of the "standard rate" filter and is more economical. It does not produce as high a degree of treatment, but in many cases it will produce as high a degree as is necessary. Another variation is the so-called "Two Stage High Rate" filters. These allow still further versatile operation but no higher degree of treatment than "standard" filters. All trickling filters are required to have post settling tanks for collection of "humus." If a higher degree of treatment is required, trickling filters, or any complete treatment process, may be followed by slow sand and intermittent filters.

Standard trickling filters may be circular, rectangular or irregular in shape depending upon the method of dosing. The circular and rectangular shapes employ revolving or other types of mechanical feeding devices, while the irregular shapes should be dosed with fixed nozzles or similar devices. Dosing tanks were formerly required for all type filters but the present practice is to omit the dosing tank when mechanical dosing is installed, and to provide means to limit low flows by recirculation. Dosing tanks, or equivalent, are still required for the fixed nozzle type due to necessity of proper distribution of applied sewage. Recirculation improves this type of filter during periods of low flow.

Trickling filters always should be preceded by primary settling tanks having a detention period of 2 to 3 hours on average design flows. Due allowance should be made for recirculation, for extra strong sewage or industrial wastes. Certain wastes, that are finely comminuted, such as dairy, milk, cannery, brewery, etc., may be conducted directly to the filters without passing through the settling tanks.

Design Basis

Filters may be designed in areas and depths, using several different standards as follows:

In gallons per acre per foot depth per day	200,000—600,000
In million gallons per acre per day including recirculation	2.0—3.0
In ppm. 5 day B.O.D. per acre per foot depth per day	250—400
Same including recirculation	250—600

In pounds of B.O.D. per cubic yard of medium—0.3-0.6. In equivalent domestic population per acre—3500. These values are higher in case of weak sewage and lower for strong sewage and certain industrial wastes.

Construction Characteristics

Mechanically fed filters of the circular type should have concrete floors sloping to a general main drain, of the gutter type, which runs through the center of the entire filter. Above the concrete floor, there should be a system of lateral drains pitched to the main drain with a slope of about 1 per cent. The capacity of the drains should be twice the maximum rate of flow and the extra capacity serves as the ventilating system. The general lateral drainage system leading to the main gutter may be in the form of a false floor of special vitrified tile which covers the main gutter as well. Facilities for cleaning, rodding, flushing and inspection of the drainage system are to be provided. When the drains are over 70 ft. long, ventilating galleries should be installed at each end, but for smaller units lamp holes may be substituted.

The exterior walls should be of concrete design to resist flooding for

*Previous parts of this series appeared in August and October.

purposes of insect and filter control. When flooding is not provided, the underdrains may project through the walls for inspection and cleaning. The walls should not extend more than 3 in. above the stone medium

The filter medium is generally specified at 6 to 9 ft. deep of graded, clean, hard crushed rock, gravel, slag or field stone carefully laid, after being screened again on the site, and with no dumping or trucking allowed on the filter during construction. Specifications call for the A.S.C.E. soundness test of f-20 for at least the top 2 feet of medium, which may be reduced to f-10 for the remainder.

Dosing Apparatus

Rotary apparatus usually has four or more arms, but arranged so that only two need be used in winter. All arms should have bleeders at the ends for drainage. Constant sewage application is preferred, and minimum flows should be limited by recirculation of sufficient sewage to properly operate the mechanism. If dosing tanks are used, and they are mandatory in some states, the capacity is small to allow frequent dosing. These general requirements also apply to rectangular filters.

The fixed nozzle, or similar type filter, requires dosing tanks, which sometimes may be omitted providing the plant is suitably designed. Dosing tanks should be in duplicate and of small capacity to allow frequent and regular dosing and to give a minimum rest period between cycles. A loss of head of 18 to 30 in. should be allowed for the rotary type feeder, and 6 to 8 ft. loss for the fixed nozzle type, plus losses in the feedlines and nozzles. Dosing tanks are required to have greater flows at minimum head than any peak plant flows.

General requirements call for provisions to chlorinate and to flood the filters, to house filters with proper ventilation and lighting in extremely cold climates, and for the filter effluent to discharge into final settling tanks or intermittent sand filters or both, for final treatment.

HIGH RATE TRICKLING FILTERS

This type filter is fundamentally based upon applying a dilute sewage in greater volume upon a shallower filter with coarser medium. A recirculation rate of at least 50 to 300 per cent of average flow may be used.

The applied sewage volume is 10 to 30 mil. gal. per acre per day, with 5 day B.O.D. per cubic yard of medium limited to 1.5 to 2.0 lb. or 1000 to 3000 lb. of 5 day B.O.D. per acre foot per day.

The filter medium ranges from 3.0 to 8.0 ft. in depth and 2 to 4 in. in size. It should be graded, placed and specified similar to standard rate filter medium.

The two stage high rate filters have twice as many units, but two are operated in series with an intermediate settling tank as well as a final settling tank. This process employs still higher rates of application of 15 to 30 mil. gal. per acre per day or not over 1.8 pounds of 5 day B.O.D. per cubic yard of medium. Each of the two filter units should have equal volumes of media. The intermediate settling tank should have a capacity equal to half the primary plus the final tank in most cases.

High rate filters must be preceded by primary settling tanks having a detention period of 1.5 to 2.0 hours on the average flow with allowance for recirculated sewage. This is less than 2 to 3 hours required for standard rate filters. High rate filters should be followed by final tanks having a detention period of 2 to 2½ hours with allowance for recirculated sewage. This is more than the 1 to 2 hours required by standard filters.

ACTIVATED SLUDGE

Activated sludge treatment is advised for large plants where a high degree of treatment is necessary, where there is a limited site area or where the plant is located in a built-up area. It has the advantage of turning out an effluent low in B.O.D. which is necessary when discharging into small stream or one having low dry weather flows. Odors and troubles from insects are not frequent.

It has the disadvantage of having higher first costs and operating costs than trickling filters and of requiring expert supervision. It is a delicate process and easily upset by certain types of trade wastes, sudden high and peak flows, quick changes in the character of the sewage and by any septic conditions. While the primary tanks may be smaller, the other treatment units must be larger in size and capacity, including the final tanks, sludge digesters and sludge drying beds.

Activated sludge units should be preceded by primary settling tanks but extreme efficiency in removals is not necessary. A detention period of 1 to 2 hours is required, depending upon strength of sewage, character of trade wastes, etc. Settling and weir overflow rates are not critical, but grease removal and elimination of septic conditions are highly important. Waste sludge is usually returned to the primary tanks where it is combined with the raw settled sludge.

Pre-aeration of the primary tank effluent and before addition of the return activated sludge is advisable, if the sewage is very stale or if very strong. It will also help segregate the grease contained in certain trade wastes for easy removal, for grease is troublesome in the activated units. The volume of any pretreatment tank may be deducted from that required for the activated units.

Activated sludge plants generally are laid out in treatment lines, each comprising primary settling, activated and final settling tanks. There should be at least two duplicate lines. Piping or conduits should be arranged so that each line may be operated independently, or the sewage may be brought together after each unit, for ease in certain operations. A by-pass is necessary around each aerating unit to the final tanks, so that in case of trouble the aerating units may be put out of service. Facilities should be furnished so that any unit may be dewatered by pumping the sewage to the other aerating tanks.

"Activation" is adversely affected by sudden unusual peaks in flow, generally caused by storm water when the sewerage collection system is combined. Overflow weirs before the activated units should be provided for handling storm flows and the overflow piped to the final tanks.

The activated sludge process may be seriously damaged by sudden discharges of acid or other wastes into the sewers. While neutralization equipment may be provided to meet this problem it takes some time to become effective. Quick acting valves and gates should be provided so that activated units may be quickly shut off, and the sewage bypassed to the final tanks using the bypass or the overflow weirs.

Aeration

"Activation" is obtained by bringing sewage and return sludge into contact with air introduced either by mechanical means, such as revolving paddles, or by diffused air forced through pipes or plates or partly by both. Mechanical aeration is not prohibited, but compressed and diffused air is very much preferred in practically all states except in case of very small installations.

If mechanical aeration is used, the tanks should be arranged for both series and parallel operation, and provide more detention time. Using diffused air, aeration tanks should have a detention period of 4 to 6 hours on average flows plus 25 to 30

per cent return sludge. For strong sewage or special trade waste conditions, this period may be increased to 6 to 8 hours. For mechanical aeration, the detention period should be from 8 to 10 hours on average flow plus 25 to 40 per cent return sludge. Channels, pipes and pumps handling return sludge should be designed for 50 per cent return sludge maximum.

Pre-aeration of settled sewage from the primary tank, re-aeration of settled returned activated sludge from the secondary tank before entering the activated units, and concentration of returned activated sludge, will tend to reduce the detention period and size of units. Difficult trade wastes, strong sewages and high peak flows, will tend to increase the detention period.

The air supply required, when diffuser tubes are used, is about 1 cubic foot of free air per gallon of sewage, or sufficient to cause three complete turn-overs of sewage per hour.

The air supply required, when diffuser plates are used, is about 2 cubic feet of free air per gallon of sewage. Porous plates should have a permeability of 25 to 40, and pass 1.0 to 3.0 cubic feet of free air per square foot per minute.

The air supply provided by mechanical aeration should be 0.5 to 1.0 cubic foot of free air per gallon of sewage. Compressed air supply should be filtered, and pressures maintained between 5 and 10 pounds. At least two blowers should be provided, each with a capacity of 15 to 50 per cent more than the average rate. Multiple blowers should provide the same amount with the largest unit out as a spare. Provisions should be made to vary the air output rate.

Tank Characteristics

Tanks for use of diffused air, are generally 15 feet in depth and up to 30 feet in width, with flat or ridge type bottoms. These dimensions may be reduced to 10 and 15 feet in small installations. Units should be made as long as possible with minimum length to width ratio of at least 5:1. Channels and tanks should have bottom fillets to prevent accumulation of sludge, and the tops of the walls should have directional baffles to assist spiral circulation. Inlet ports should be designed to keep entrance velocities below 0.5 foot per second. Tanks for use of mechanical aeration may have square, round or hopper shaped bottoms, 9 to 19 feet deep. Trough shaped bottoms should have a slope of 35 to 40° with the horizontal. All units must be provided with convenient walkways for inspection, sampling, and repairs. A water supply is necessary for washing and cleaning.

From the aeration units, the effluent passes through final settling tanks, which should be in duplicate, and of the mechanically cleaned type. The detention period should be 2 to 2½ hours based upon average flows plus the return sludge. The settling rate in gallons per square foot tank area should be 800 to 1000, and the weir overflow rate on average flows should not be over 5000 gal. per lin. ft. or not over 15,000 gal. per lin. ft. of weir per day on peak flows. Provisions must be made to eliminate all dead corners in channels and tanks, in order to prevent deposits and septic action.

Sludge withdrawn from each final tank should be proportioned by means of slip or swing pipes, if brought into a common pump well. There should be at least two sludge return pumps, each with a variable capacity from 15 to 50 per cent of the average rate of sewage flow.

Return Sludge

Return sludge is divided into two parts. One part is returned to the inlet of the activated units and the other part is "wasted." Facilities are required to vary the amount of each part from 0 to 100 per cent.

Waste return sludge may go either directly to the digester or to the inlet of the primary tank, where it will be combined with the primary sludge. Sludge should be concentrated if pumped directly to the digester, for a large volume entering the digester is apt to upset the digestion and withdrawal processes.

If the return sludge is in danger of becoming septic, due to long detention periods or for other reasons, a 30 minute detention tank should be provided and the sludge pre-aerated before entering the activated units. While this is an added expense, the size of the activated units may be correspondingly reduced. If the return sludge is concentrated before entering the activated units, the size of the activated units and also the final settling tanks may be reduced.

Provisions for sampling, inspection, measuring and recording of all flows including the air supply are required.

INTERMITTENT SLOW SAND FILTERS

Sand filters are beds of sand 24 to 36 in. in depth with a system of underdrainage. Sewage is periodically dosed on the surface of the sand and the clear liquid seeps through the sand to the underdrains, leaving the impurities on the surface. When the amount of impurities collected is sufficient to lower the rate of filtration too much, the bed is laid out of service for drying and cleaning.

Sand filters effect high removal of suspended solids, B.O.D., colloidal matter and bacteria, but inasmuch as large sand areas are required, sand filters are more applicable to small installations. They may be used after primary treatment units such as settling tanks, Imhoff tanks, septic tanks, etc., or may follow complete treatment plants, in order to give a still higher degree of treatment. In the latter case the loadings can be greatly increased.

Operation of sand filters is laborious but extremely simple. The operation of drying and cleaning can seldom be done in winter, so the beds are usually cleaned just before cold weather, deeply furrowed to hold up the ice, and not again cleaned until spring. This reduces the allowable loading and increases the necessary size. In extreme cold climates allowable loadings are so low and operation so difficult, that several states will not approve their use.

Sewage is applied by means of dosing tanks operating to give doses of 1 to 4 in. deep two to four times each day. At minimum head in the dosing tank, the rate should be at least twice the maximum flow, or about 1 cfs. per 5000 square feet. Means must be provided to alternate the flows to the various beds.

The filter should be constructed inside of earth embankment walls, or preferably with concrete retaining walls, as they prevent wash of earth on the filters. At least two units are required and the filter is divided into beds by concrete curbs.

Loading Rates

The filter area is dependent upon the rate of filtration which in turn is dependent upon the characteristics of the sand including the effective size and uniformity coefficient. Due to the large volume of sand, it is not practical to import a standard filter sand, but to use local sand, washed and processed. The allowable loading is determined upon the sand actually used by experiment. The following table shows rates of flow in gallons per acre per day to be expected by various effective sizes of sand with a coefficient of uniformity of 1:

LOADING IN GAL./ACRE/DAY

Effective Size of Sand	Imhoff Tank Effluent	Septic Tank Effluent
0.2 mm	120,000	80,000
0.3 mm	140,000	100,000
0.4 mm	160,000	120,000
0.5 mm	180,000	140,000

The following table represents average recommended applied loads in gallons per acre per day upon sand filters, when following Imhoff tanks:

In warm climates where winters are short or none at all	150,000
In medium climates having an average winter	110,000
In cold climates where winters are long and severe	70,000

The size and shape of the units depend upon the distribution method employed to flood the filters, and the requirement to flood each filter two to four times each day. Sewage is distributed over the sand surface by underground piping, by perforated pipes, tiles and troughs laying on the surface of the sand. The openings in distributors are spaced so that the length of travel is not more than 20 ft. If the bed is more than 20 ft. wide at least two distributors are required. Splash plates are placed under the openings to prevent wash of sand.

Available local sand is screened, washed and freed from clay, loam and cementing materials. It should range in effective size between 0.2 and 0.5 mm. with a uniformity coefficient not over 3. The sand layer should be at least 30 to 36 in. deep when first installed, and renewed when the sand depth is reduced to about 18 in. by the cleaning operation. Beds used only in summer, however, may be only 18 in. in depth.

The sand overlays a layer of gravel at least 6 in. thick above the top of the underdrains. The gravel consists of several layers ranging in size from ¼ in. at the top to 1½ in. at the bottom. The coarser size is carried down around the underdrains.

The underdrains are laid in trenches or valleys on boards and with open joints to ⅛ to ¼ in. wide. The top half of the open joints are covered with cheese cloth or muslin. Some states allow use of tar paper. Pipes should be surrounded on both sides by at least 6 in. of coarse gravel.

FINAL SETTLING TANKS

The requirements of final settling tanks depend upon the type of treatment employed. After standard trickling filters, final or "humus" tanks are generally mechanically cleaned to permit frequent and regular removal of sludge, and for convenience when recirculation is employed. Hopper bottomed tanks, however, can be used for small plants with a connected population of less than 2000. Without recirculation, sludge may be pumped to the digester, to the inlet of the primary or to the sludge drying beds.

Recirculation of the final settling tank effluent, up to 50 per cent of average flow, is advised in order to keep the sewage fresh and to allow proper minimum flows on the filters. The higher recirculation rates are used when the B.O.D. of the sewage is greater than normal. Recirculation may be made to a point before the filters, to the influent to the primary tank or divided partly between the two. When recirculated to a point before the filters, the clear effluent is recirculated. When recirculated to the inlet of the primary tanks, it is usually taken from the bottom of the tank and contains the settled sludge from the final tank.

If the sewage is abnormally strong, has unusually high peak flows or if there are fixed nozzle type of beds, extra increased allowances should be made for recirculation. Capacities of tanks must in all cases include allowances for recirculation.

Tanks after high rate filters may be similar except much larger, as the volume of recirculated sludge may be several times the average flow. Sludge routing and handling requirements are also similar.

Two stage high rate trickling filters require an intermediate settling tank as well as a final tank. Both tanks are usually balanced in size, and mechanically cleaned as hopper bottomed types are not feasible.

Tanks should be in duplicate so that one tank may be operated, when the other is out of service. Provisions are made to drain either tank. Tanks may be rectangular or circular in shape. Rectangular tanks should have a length to width ratio of about 3:1 for small tanks and about 4:1 for larger units.

Tanks following activated sludge treatment are required to be in duplicate, of the mechanically cleaned type, not less than 8 ft. depth, with all channels, launders, troughs etc. sloped, and all dead corners filled in or filleted to avoid accumulations of settled sludge, which might lead to septic action. If tanks are rectangular, the ratio of length to width is about 5:1, and both rectangular and circular tanks should be carefully baffled, to prevent cross circuiting and to evenly distribute the flow. Extreme care must be used in the design and placing of effluent weirs to avoid the occasional escape of sludge particles.

Sludge should be evenly withdrawn from each tank, to preserve the sludge balance, and this may be done by using slip or swing pipes to a common pump well. From the pump well, non clog type of sludge pumps may lift the return sludge to a division box, where waste sludge is to be separated and the remainder returned to the activated units. If waste sludge is pumped directly to the digester, it should be concentrated to avoid disturbing the action of the digester. If return sludge to the activated units is concentrated, the capacity of both activated units and final tanks may be reduced. Return sludge is usually about 25 per cent of the average raw sewage flow, but may be increased up to 50 per cent. Provisions are necessary to empty each tank into the other or into the aeration units. Pumps used should be arranged to pump between 10 and 50 per cent of flow and sampling facilities should be provided at all critical points.

The capacity in hours detention, based upon average raw sewage flow, settling rates in gallons per square foot area, based upon combined flows, and weir overflow rates in gallons per linear foot of weir, based upon combined flows, are given for final tanks following the various processes:

	Hours detention	Settling Rate gal./sq. ft./day	Weir Overflow Rate gal./lin. ft./day
After standard tricking filters	1-2	600- 800	
Max. flows should not exceed		1000-1200	15,000
After high rate filters	2-2½		
Max. rate		800	
After activated sludge	2-2½	800-1000	5,000
Max. rate should not exceed			15,000

All other design features not enumerated above are similar to primary tank design, and covered in Article II.

CHEMICAL PRECIPITATION AND FLOCCULATION

This treatment, when installed, precedes primary settling and conditions the raw sewage for more effective settling. Chemicals are applied to the raw sewage and thoroughly mixed in a flash mixing chamber, followed by a period of mechanical flocculation, before entrance to the primary tanks. Even without application of chemicals, flocculation will improve settling to some extent. Chemical precipitation is not secondary treatment. It is an

aid to primary treatment to reduce the load on secondary treatment processes.

Chemical treatment is advised as a part of a plant, when the sewage contains a large percentage of certain kinds of trade wastes, or when loadings have high periodical or seasonal peaks. Also greater efficiency is sometimes required during periods of low stream flows. Chemical treatment can be later installed as an emergency measure for the purpose of supplementing overloaded treatment works. In general it is not adapted for use in smaller plants as it requires skilled supervision for 24 hours per day.

A wide variety of chemicals are used. Ample storage and facilities for easy handling of the chemicals are necessary. If chemicals are made at the plant the process should take place in a separate building having its own laboratory facilities.

Chemicals are fed in either dry or solution form, and provisions are necessary to allow a wide range in dosing, to meet varying conditions. Dosing is generally automatic, and the rate of feeding proportioned to the rate of sewage flow. Chemicals are applied to the raw sewage in a flash mixing tank with a detention period of one minute. Mixing is done by use of paddles, propellers or diffused air.

Flocculating tanks should be in duplicate with a detention period between 15 minutes and two hours, depending upon results required and type of sewage to be treated. The chemicals used, and amount and time of flocculation, are determined by experimentation or by results of previous installations of the same type.

The design details depend upon the type of mixing and manufacturers' requirements. The flocculating mechanism should be adjusted to give a velocity of not more than 6 in. per second, with facilities to vary the speed of the mechanisms. Each tank should have its own mechanism and controls. The same design is applicable to flocculation treatment without use of chemicals, but the flash mixer is generally provided for emergency purposes, or in case chemicals are only occasionally used.

When chemicals are used, the primary tanks should have a detention period of at least 2 hours and a settling rate of no more than 1000 gallons per square foot area per day on average flow. Percent removals in primary tanks are increased by plain flocculation without use of chemicals and by chemical precipitation with flocculation as follows:

Removals	Flocculation without Chemicals	Flocculation with Chemicals
B.O.D.	10-15%	25-35%
Suspended solids	5-10%	20-30%
Settleable solids	4- 5%	4- 5%

Complete treatment with sprinkling filters increases per cent removals over primary settling only as follows: For B.O.D. about 55 per cent and for suspended solids 20 to 40 per cent.

It is interesting to note that chemical precipitation with flocculation and settling in primary tanks produces nearly the same removal of suspended solids as complete treatment, but with only half the removals of 5 day B.O.D.

(This completes the series on Sewage Works Design Requirements.)

Ohio Compact Comm. Asks Priorities for Pollution Abatement

President Truman, members of Congress and all federal agencies designated to execute policies relating to the defense-mobilization program were among those petitioned to join with the Ohio River Valley Water Sanitation Commission in recognizing the new urgency for pollution-control measures in a resolution adopted by the the Commission at its last quarterly meeting.

Pointing out that the Congress-approved interstate compact agency that was established by eight states in 1948 has been striving to preserve limited water resources in the Ohio valley through abatement of pollution, the resolution asked for adequate priorities on materials to insure construction of waste-treatment works. Some of these municipal and industrial plants have already been started and construction on many others is ready to be activated.

"Disturbing reports have already reached the Commission," says the resolution, "that installation of waste-treatment plants may have to be postponed because of growing shortages of material. It must be recognized that industrial production cannot be maintained or expanded without the basic resource of clean waters, nor can the communities that supply the manpower and services essential to industry continue to exist without safeguards to these water supplies."

The Commission asserted that pollution-control measures so urgently needed in the Ohio River valley have been retarded for almost a decade because of World War II, and now that their execution has been advanced to the point of imminent construction any further delays would menace public health and national welfare.

The Federation passed a similar resolution at its meeting in Washington in early October.

They said he was our "Water Work's Hermit" living way back on the watershed—but, look what happens to his temperature every time I take his pulse, Doctor.

Houston Votes to Expand Water Supply

Houston, Tex., has voted four-to-one to spend $24,000,000 for an addition of 150 mgd. to its water supply. The water is to come from the San Jacinto River and, added to the present well water supply, will give the city a total capacity of 280 mgd.

With a population of 593,600, a 54 per cent increase since 1940 and a metropolitan area population of 810,000, expansion of the water supply facilities has become imperative.

Specifically, the $24,000,000 in water bonds will provide a $7,500,000 dam and a $1,585,000 reservoir on the San Jacinto River, plus a $4,500,000 filter plant with a capacity of 50 mgd. and an ultimate capacity of 80 mgd., plus a $375,000 pumping plant on the river and $2,000,000 for purchase of independent water systems as a result of annexation of territory formerly served by water districts and private companies.

Additional monies will be expended for lining a canal to bring water to industries, for relocation of railroads, pipelines and so forth at the reservoir, for construction of arterial mains and for administrative and engineering costs. Work is to be started early in 1951 and is scheduled for completion in mid-1952.

56th ANNUAL PUBLIC WORKS CONGRESS

Civil Defense and Sewer Maintenance Featured

THE American Public Works Assn. held its 56th Annual Public Works Congress at the Ninth Regiment Armory and the Hotel New Yorker on October 15-18. The first day of the meeting was devoted to a general session and several round-table sessions.

The meeting was opened by W. O. Jones, President and was addressed by Frederick H. Zurmuhlen, Commissioner of Public Works of New York City and Acting Mayor Vincent R. Impelliteri, both of whom spoke on the work and plans of New York City for public works including sewage treatment.

Also on the morning session was a symposium on the "Civilian Defense Commission—The Role of Public Works." Appearing on this symposium were Lawrence Wilkinson, Director, New York State Civil Defense Commission, New York City; Arthur W. Wallander, Director, New York City Office of Civil Defense, New York City; and Theodore C. Eppig, Co-Deputy Director, Public Works Division, Chicago Civil Defense Organization, Chicago, Ill.

Sewer Maintenance

Under the Chairmanship of Edward F. Nier, Commissioner of Public Works, Rochester, N.Y., one roundtable session was devoted to sewers and sewage treatment.

Speaking on "SEWER MAINTENANCE AND CLEANING PRACTICES," John W. Hood, Supt., Sewage Treatment Plant, Ridgewood, N.J., said that lack of sufficient funds kept proper sewer maintenance from being done in many cities. One of the reasons is that the public has an apathy to sewers because they never see them. Another is that the public departments clamor for budget money and the sewer department is often the last to get what it wants.

In spite of popular belief sewers do not last forever and must have attention even if they are out of sight under the ground. But there are several reasons why sewers must receive maintenance.

These are: to eliminate stoppages which may create public health hazards by contamination, (2) prevent noxious odors and lethal gas formations which are a threat to both life and property, (3) prevent equipment from deterioration induced by obstructed lines, (4) maintain carrying capacity of pipelines, (5) keep B.O.D. from increasing due to decomposition in sewers and (6) reduce load on sewage treatment plant and hence aid in pollution abatement.

Mr. Hood discussed each of these thoughts and described how to use copper sulfate to prevent root growth in sewers and thereby eliminate sewer stoppage from roots. Mr. Hood also discussed the use of Oxidation-Reduction Potential tests as a means of determining the condition of sewage, and he concluded that the public is best served by adequate sewer maintenance. (Mr. Hood's complete paper appeared in the November issue of *Water & Sewage Works.*)

Sewage Plant Operation

Edward P. Decher, Secretary, Joint Sewer Commission, Elizabeth, N.J. spoke at length on "OPERATION AND MAINTENANCE OF SEWAGE TREATMENT PLANTS". While sewage treatment has none of the glamour of the other public services and the public practically ignores the service, much research is going on in the field and it is a growing force in public health.

Mr. Decher made a number of suggestions for the proper functioning of sewage treatment services. In the first place he believes that a competent superintendent should be employed during construction and be on hand to take over the operation of the plant which he has seen constructed.

Mr. Decher is also a firm believer in the need for adequate personnel to man the sewage plant and adequate funds to operate it properly. Proper maintenance is a means, not only of keeping the plant operating but of keeping operating costs down and replacement costs at a minimum.

Among the other suggestions for plant supervision, Mr. Decher suggested setting up rules and regulations and sending of employees to short schools and providing proper safety equipment as well as a suggestion box for employees.

For good operation, proper lubrication is essential. In order to obtain the best advice, call in the oil companies for a survey of the plant. Records should be kept of oiling and all maintenance. Records should also be kept of operating results, and a good laboratory is essential to good results. Keep plenty of spare parts on hand and subscribe to all of the magazines in the water and sewage works field. Both spare parts and knowledge of what is going on in the field are an excellent aid to the operators in performing their work.

Second Convention Chesapeake Section

The Second Annual Convention of the Chesapeake Section of the AWWA was held at the Hotel DuPont in Wilmington, Del., on Nov. 1, 2, and 3. David Auld, of Washington, D.C., was elected to succeed Clarke Gardiner as Chairman of the Section.

Papers on the program included the topic of Ground Waters in the Chesapeake Bay Area, both East of Bay and the West of Bay.

Control of water supplies in Delaware was discussed by Donald K. Harmeson, Director, Div. of San., Del. State Dept. of Health. A panel on Water Wells was presided over by Albert G. Fiedler, Asst. Chief, Ground Water Branch, U.S. Geological Survey, Washington, D.C. Four participants sat on this panel and discussed such topics as development of supply, selections of deep well pumps, water well abuse, and rehabilitation of wells.

A symposium on meters covered the subjects of selection of meters, installation and maintenance, and billing and reading. Another panel dealt with the subject of air conditioning demands. This panel was chairmaned by R. C. Willson of Hagerstown, Md., and contained four other speakers.

A public relations movie, ion exchange, bacteriology and civil defense, significance in water supply completed the program.

Principal speaker at the convention was W. Victor Weir, Pres. of the Amer. Water Works Assn. and Pres. of the St. Louis County Water Co.

SETTLING TANK DESIGN

Corrections to Article by Prof. F. Poepel*

FOLLOWING the publication of Professor Poepel's paper in the October issue of *Water & Sewage Works*, the editors received a letter from Prof. H. M. Gifft, Head, Dept. of San. Engr., School of Civil Engineering, Cornell University, in which he called attention to certain obvious typographical errors and inaccuracies in the printed article. Prof. Gifft also made some additional comments on Poepel's theories and conclusions. Because it is desirable to give Prof. Poepel and his translator, Mr. C. E. Keefer, an opportunity to comment on Prof. Gifft's discussion, that discussion will not be published until next month. On the other hand it seems highly desirable to point out the inaccuracies in the paper as printed.

Most of these inaccuracies and typographical errors resulted from the unfortunate choice of the letter *l* to represent certain values. Because of typewritten equations in the original manuscript this letter has been confused in several places with the numeral 1. In preparing these corrections, reference has been made to the original manuscript of the translator, and herein the italicized letter *l* will be used to insure differentiation. Certain other errors and possible sources of misunderstanding need correction or clarification. With this thought in mind, the editors have prepared the following corrections and amplification of the article as it appeared in print.

It was unfortunate that the dot (•) was used to signify multiplication, first because it is misplaced in several equations (it should be at the vertical mid-point of any line in which it appears), and secondly, because its use was not consistent. While in the printed article, the multiplication dot appears on the same line as the proper location of the decimal point, the editors believe that it will not be confused with the decimal point if the equation is carefully read. In these corrections, however, we shall eliminate the multiplication dot and use the multiplication sign × where multiplication symbols are absolutely necessary; otherwise none will be used.

*Translated by C. E. Keefer and published in W. & S.W. for October 1950, p. 422.

Symbols with Two Meanings

On page 422, in equation (1), the letter *n* is used to signify "viscosity of the liquid in grams-sec. per sq. cm., whereas on page 426, column three, the letter *n* signifies the length to width ratio of a tank or

$$n = \frac{l}{b}$$

where the letter *l* equals length and the letter *b* equals width.

Also in equation (1), the letter *l* signifies "specific gravity of the liquid," while in all other equations the letter *l* means length of settling tank. (Note where the letter *l* should be the numeral 1, or vice versa, the corrected equations will be given herein.)

In equations (1), (6), (7), and (8), the letter V is a capital letter and signifies "specific gravity of suspended material." In all other cases where the letter *v* appears, it is, or should be, a lower case letter and it signifies velocity of flow of the liquid. Therefore, the unnumbered equation in column two on page 423 should read

$$d = \sqrt{\frac{h}{fc}} \times \sqrt{v} \text{ mm}$$

Corrections to Equations

Equation (19) on page 423 should read

$$\frac{R}{h} = \frac{l}{h} = \frac{1}{c} \times \frac{v}{d^2} \dots (19)$$

Equation (20) on page 423 should read

$$\frac{R}{h} = \frac{l}{h} = \frac{1}{0.57} \times \frac{d}{d^2} = \frac{1.75}{d} \dots (20)$$

On page 423, in table 2, first column of the table, line 2 should read "Velocity, m/sec.," not Velocity, m/hr

On page 423, column two, paragraph one under section headed "Horizontal Movement Exerts but Little Influence," the last sentence should read, "If the velocity in a settling tank is doubled, only suspended solids 1.414 (i.e. the square root of 2) times as large [or 0.414 times larger] will be removed."

Equation (24) should read

$$R = \sqrt{\frac{q}{\pi c d^2}} = \frac{1}{\sqrt{\pi c}} \times \frac{1}{d} \times \sqrt{q} \dots (24)$$

On page 424, first column, the first unnumbered equation should read

$$v = \frac{R}{h} \times s = c'(cd)$$

Equation (25) should read

$$h = \frac{1}{\sqrt{\pi c}} \times \frac{1}{d} \times \sqrt{q} \times \frac{1}{c'(cd)} \times cd^2$$
$$= \frac{1}{\sqrt{\pi c}} \times \frac{1}{c'} \times \sqrt{q} \dots (25)$$

Equation (26) should read

$$t = \frac{1}{\sqrt{\pi c}} \times \frac{1}{d} \times \sqrt{q} \times \frac{1}{c'(cd)}$$
$$= \frac{1}{\sqrt{\pi}} \times \frac{1}{c^{1.5}} \times \frac{1}{c'} \times \frac{1}{d^2} \times \sqrt{q} \dots (26)$$

On page 424, column three, in the first line following the second unnumbered equation, it should read "A comparison of the two values of c'"

On page 426, column two, in equations (27), (28), and (29), all of the "ones" are the numeral 1.

On page 426, column three, paragraph two should read, "If *b* is expressed as a function of *l* in the form of

$$b = \frac{l}{n}$$

where *n* equals the ratio of length to width, it follows from equations (2) and (17) that the length of the rectangular settling tanks is

$$l = \sqrt{\frac{n}{c}} \times \frac{1}{d} \sqrt{q} \dots (30)$$

With the introduction of

$$\frac{l}{h} = a$$

in equation (18b), it follows that

$$v = \frac{l}{h} \times s = acd^2$$

In equations (31) and (32) and in the last unnumbered equation, which are correctly reproduced, all of the "ones" are the numeral 1.

It is hoped that the above corrections constitute all that should be made in the article as printed. If any additional errors are discovered by our readers, the editors will be pleased to receive them. Comments on Prof. Poepel's ideas and conclusions will also be welcomed for publication. (The Editors.)

21ST ANNUAL FALL MEETING NESWA

Bridgeport, Conn., Draws Good Attendance

Presidents

Incoming
Wm. S. Wise
Ch. Engr.
St. Water Comm.
Hartford, Conn.

Retiring
R. W. Horne
Fay, Spofford & Thorndike, Engrs.
Boston, Mass.

THE 21st Annual Fall Meeting of the New England Sewage Works Assn. was held in Bridgeport, Conn. this year with a highly satisfactory attendance. One hundred twenty-one persons attended the luncheon and a few more registered for the meeting. Highlights of the meeting included a welcome by the long time Socialist Mayor of the City of Bridgeport, the Honorable Jasper McLevy, and an inspection of the new sewage works of Bridgeport, designed by H. K. Gatley, Cons. Engr.

New Officers

The following slate of officers was elected to serve for the ensuing year.

President
William S. Wise,
Chief Engineer
State Water Commission
Hartford, Conn.

1st Vice President
E. Sherman Chase,
Partner
Metcalf & Eddy, Engineers,
Boston, Mass.

2nd Vice President
Eugene L. Bond,
Superintendent
Dept. of Sewers and Engr.
Greenfield, Mass.

Directors
Anthony W. DuPont,
Superintendent
Sewage Works
Bristol, R.I.

Clair N. Sawyer,
Prof. San. Chem.
Civil Engr. Dept.
Mass. Inst. Tech.
Cambridge, Mass.

Norman W. Wagner,
Operator,
Sewage Treat. Plant
Stamford, Conn.

Secretary-Treasurer
Walter E. Merrill,
Pub. Health Engr.
State Dept. of Health
Boston, Mass.

Aerobic and Anaerobic Reactions

"AEROBIC AND ANAEROBIC REACTIONS" by F. Wellington Gilcreas, Assoc. San. Chem., Div. of Labs., N.Y. State Dept. of Health, Albany, N.Y.

Mr. Gilcreas began his talk with a review of what constitutes sewage, and the small amount of solid and

Director
C. N. Sawyer
Prof. San. Chem.
Mass. Inst. Tech.
Cambridge, Mass.

Secy.-Treas.
W. E. Merrill
Pub. H'lth Engr.
St. H'lth Dept.
Boston, Mass.

organic material it contains. Sewage with but about 300 ppm. of organic matter, most of which is composed of carbon, oxygen, hydrogen, nitrogen, phosphorus and sulfur, must be broken down to oxidized substances, principally carbon dioxide and water in order to stabilize it.

Sewage treatment consists of the controlled breakdown of these organic compounds to their simpler components. This could be done chemically but it is cheaper and easier to do it by depending on microscopic organisms; bacteria, protozoa, etc. These saprophytic organisms are tremendous workers, eating and reproducing continuously and thus accomplishing this breakdown of organic matter. They are well organized and each type has a special job to do. They need optimum conditions for their work and this is supplied by proper operation of a sewage plant.

Some bacteria operate in the absence of dissolved oxygen, some require its presence to exist and some can live in either the presence or absence of free oxygen. The former are called anaerobes, the second are aerobes, and the latter are facultative organisms.

1st Vice Pres.
E. Sherman Chase
Partner
Metcalf & Eddy
Boston, Mass.

2nd Vice Pres.
E. L. Bond
Supt.
Sts. & Engr. Dpt.
Greenfield, Mass.

Anaerobes produce undesirable products, such as acids, odors, putrefaction, etc., while aerobes don't tear up molecules to make foul products. When the oxygen is used up the aerobes die off and the anaerobes take over. This happens in streams which are overloaded with pollution. In sewage plants these reactions and types of organisms are controlled and kept in their place.

The actual operators in a sewage treatment plant are the bacteria and protozoa; a "sewage plant operator" just controls their environment.

SEWAGE SAMPLING

Three papers and a round table discussion were given over to the subject of sewage sampling.

Importance of Sampling

"THE IMPORTANCE OF REPRESENTATIVE SEWAGE SAMPLING" by Warren J. Scott, Director, Div. of San. Engineering, State Dept. of Health, Hartford, Conn.

Mr. Scott opened his talk by referring to the report in *Sewage Works Journal* in 1933 on the subject, and he elaborated on a number of the ideas given in that report, which relatively is still good 17 years later.

It is important to bear in mind that analyses cost money and therefore they should not be wasted by having them made on non-representative samples. Only by representative samples can we get information on plant operation.

Mr. Scott commented on such problems as grab versus composite samples, grit sampling, salt water infiltration, and the sampling of receiving waters. For the latter it is very important to have representative sam-

Programmers

W. J. Scott
Director
San. Eng. Div.
St. H'lth Dept.
Hartford, Conn.

F. W. Gilcreas
Asst. Dir. Lab.
St. H'lth Dept.
Albany, N.Y.

Geo. C. Bogren
Cons. Engr.
Weston & Sampson
Boston, Mass.

J. H. L. Giles
Assoc. San. Engr.
St. H'lth Dept.
Hartford, Conn.

ples. A slug of pollution might well be missed, and for stream sampling, samples should be taken according to a flow time schedule.

Mr. Scott concluded with the remark that samples should not be tested to death. It is far better to have a few tests on representative samples than a large number of tests on non-representative samples.

Grab Sampling Schedules

"Rational Basis for Grab Sampling" by Prof. Edward S. Brown, Jr., Thayer School of Engineering, Hanover, N.H.

Prof. Brown's paper was read in his absence by Program Chairman Worthern S. Taylor. The paper pointed out that proper design and operation must come from analysis of correct sampling schedules. Ordinary grab samples are no good to tell the variation in sewage strength. The professor presented certain principles to increase the reliability of grab samples. These principles were confined to a discussion of B.O.D. and applied only to normal dry weather flow.

Prof. Brown suggested that by study one should find the proportional week day flow and load. For example, in some localities Tuesday through Thursday is average while Monday, both flow and load are highest (In other cities, Tuesday is highest). A study must be made to determine the best hour to sample. This can be done by determining the flow and load at various hours throughout the day and plotting a curve. Having determined the day of the week when the load is average and the hour of the day when the load is average, then it is easy to decide when grab samples should be taken. Weighted samples or analyses must be used in determining the average load. If samples cannot be taken at the time of day representing the average load, then they can be taken at any hour and calculated back to the average. (The professor's paper did not say how long it would take to determine such curves, but this reporter once devoted two years of daily study of 24 hourly samples to the determination of such curves. Evidence since then has indicated that even that was not sufficient to develop absolutely representative curves, but as a minimum, at least a month in each season is required.)

Collection Technique

"Technique of Collecting Samples" by George C. Bogren, Weston and Sampson, Cons. Engrs., Boston, Mass.

Mr. Bogren echoed Warren Scott in the thought that if the samples are no good then the analyses are wasted. Mr. Bogren pointed out that sometimes it is desirable to know the worst conditions. (This brings out the thought that if only grab samples can be collected it might be well to take them when the sewage is strongest to determine how well the plant is operating under its heaviest load. Ed.)

In general, integrated or composite samples are best and these should be composited according to flow in order to properly weight each sample. There always remains the problem of where is best to collect samples, the matter of floating particles, and the matter of size of suspended solids (and where grit is concerned the matter of specific gravity). There are also the problems of preserving the samples, and of collecting the samples at the proper flow time through the plant so that the effluent will be representative of the same influent.

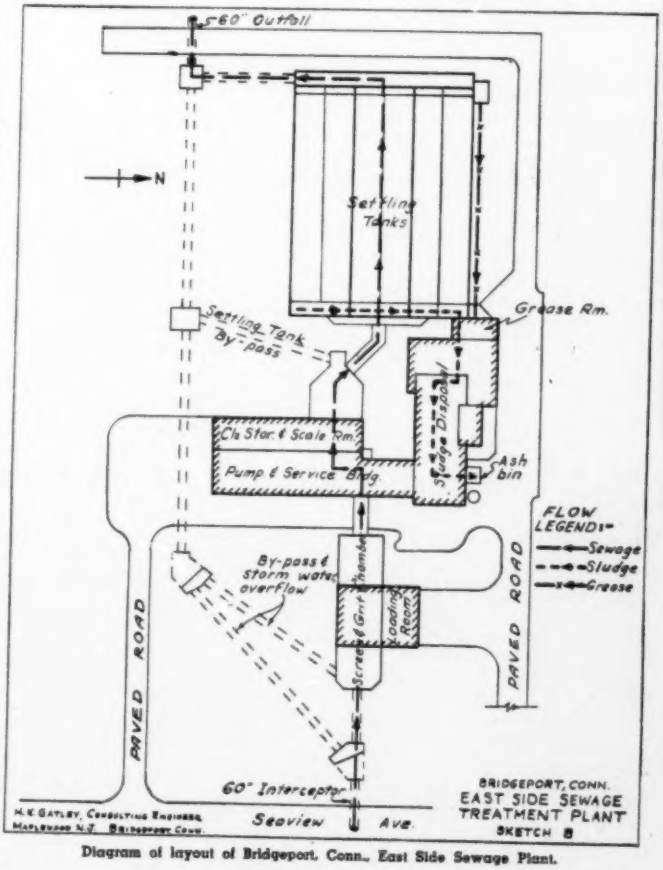


Diagram of layout of Bridgeport, Conn., East Side Sewage Plant.

Discussion

Under the leadership of J. HENRY L. GILES, San. Engr., Conn. State Dept. of Health, Hartford, Conn., a lively discussion of the topic ensued.

MR. LEBTKIN, Chemist, Hartford Sewage Works, reported on hourly sampling by pitcher pump and how other samples, including sludges, are taken throughout his plant. He favors twenty-four hour composites.

N. W. WAGNER, Operator, Sewage Treatment Works, Stamford, Conn., reported that no regular sampling was carried out but that 24 hour composites were collected at intervals. At the present time they are experimenting with the "Dorr Hydrotreater" and are using an automatic sampler.

MR. BOLDING of the Mass. Dept. of Health reported that a study of 28 sewage treatment plants showed most of them sampled only about three times a year, using grab samples. One of the principal reasons for this poor showing is because of lack of sufficient help.

SHERMAN CHASE, Metcalf & Eddy, Cons. Engr., Boston, Mass., told of his study of Reading, Pa., sewage 40 years ago when he made 24 hour studies to determine average conditions. It turned out that samples taken between 8 and 9 a.m., at noon, and at 4 p.m. gave a reasonably representative sample for the day.

FRANK FLOOD, Metcalf & Eddy, Cons. Engr., Boston, Mass., spoke about a comparison of suspended solids removal and raw sludge pumped from settling tanks. According to Flood, suspended solids data give high results.

WALTER KUNSCH, Supt., Waterbury, Conn., reported that at Champaign, Ill., the reverse of Flood's observation was true.

WM. S. WISE, Chief Engr., Conn. State Water Comm., referred to the Bridgeport studies where the 24 hour composite smoothed out the peaks, while it was the peak which is more important than the average.

Bridgeport Sewage Treatment

At the annual luncheon, Mayor McLevy addressed the group, not only to welcome the NESWA but also to tell about the sewage treatment problem of the city of Bridgeport.

The first plant was built in 1918 and cost more than today's new plant. It was a screening plant to which some additions were made in 1927. In 1933 Mr. McLevy was first elected (he has been re-elected ever since) and proposed an organization of all towns in the section. This has eventually come to pass, and under the design of H. K. Gatley, Cons. Engr., two new plants have been built to handle not only the domestic wastes of the area but also industrial wastes. When complete, the pollution of surrounding waters will be eliminated.

Before the group was conducted on a tour of the new sewage works, Mr. Gatley gave a brief description of the two plants. The trip was made to the east plant, the plan diagram of which is shown in the accompanying illustration. The total cost of the construction will be approximately $1,750,000.

SUPREME COURT TO REVIEW OHIO RIVER COMPACT

Whether the power of a state of the Union to enter into compacts with other states to which consent of Congress has been given pursuant to Article 1 of the Constitution can be limited or restricted by provisions of the state's own constitution will be passed upon by the United States Supreme Court. The court will review the question in the near future in connection with the participation of West Virginia in the Ohio River Valley Water Sanitation Compact. The United States Supreme Court has been petitioned to issue a writ of certiorari to the Supreme Court of Appeals of West Virginia to review the judgment of that court which held that ratification and enactment into law of the Ohio River Compact was unconstitutional and that appropriation of funds by the West Virginia legislature to cover that state's proportion of the expense of operating the Ohio River Commission was improper. Action of the West Virginia Court upheld Edgar B. Sims, Auditor of West Virginia in his refusal to honor a requisition which had been submitted to him for payment of West Virginia's proportion of operating funds for the Ohio River Commission. The United States Supreme Court will now pass upon that matter.

The Ohio River Compact was entered into by the States of New York, Kentucky, Indiana, Illinois, Ohio, Pennsylvania, West Virginia and Virginia and was executed on behalf of all of the states on June 30, 1948, pursuant to enabling legislation previously adopted by each of these states. Consent and approval of Congress had been given July 11, 1940. While the Compact fully preserves the sovereignty of each of the compacting states, yet it provides for the pooling of the powers of the various states to accomplish pollution abatement in interstate situations which the individual states operating separately and independently of each other could not effectively handle alone.

Other questions upon which the United States Supreme Court has been asked to rule include such interesting questions as these:

If the power of a state of the Union to enter into compacts with other states of the Union can be restricted by the provisions of its own constitution, does the Constitution of the State of West Virginia restrict such power.

If the Constitution of the State of West Virginia can and does restrict the power of that state to enter into compacts with other states of the Union, then, does the Ohio River Valley Water Sanitation Compact subject the State of West Virginia to any obligation in violation of its constitution?

Whether ratification and enactment into law of the Ohio River Compact by the Legislature of the State of West Virginia resulted in an unconstitutional delegation of police power or of legislative authority.

Review of the case by the Supreme Court of the United States was sought by the State of West Virginia represented by Dr. N. H. Dyer and W. W. Jennings, Commissioners of that state in the Ohio River Commission, and by representatives of the State Water Commission of West Virginia. Other briefs filed with the Supreme Court of the United States in support of the petition for a review of the case included one filed jointly by Ohio, Indiana, Kentucky, Illinois, New York and Pennsylvania, and the Interstate Commission on the Potomac River Basin.

Wage & Salary Administration

National Foremen's Institute, Inc., Deep River, Conn., has available a book entitled "PRINCIPLES OF SALARY AND WAGE ADMINISTRATION" by A. W. Barbour. The book shows how to build up a satisfactory wage structure. The author shows how important it is to size up every single job in a plant. Mr. Barbour urges a new job evaluation survey once a year and a close working arrangement between supervisors and the Wage Administration Staff.

This book may be obtained from the National Foremen's Institute, Inc., at $2.50 per copy F.O.B. Deep River, Conn.

PENNSALT LOOKS BACK OVER A CENTURY OF PROGRESS

PENNSALT is probably the oldest chemical company in continuous operation in Pennsylvania and definitely is one of the oldest in the United States. It was on September 25, 1850 that George T. Lewis and four friends acquired a new patent and organized the century-old Pennsylvania Salt Manufacturing Company to make "the alkaline salt of soda." This was the first chemical manufacturer chartered under Pennsylvania's first General Incorporation Law of 1847. The company's name is a result of the provisions of this statute, for, while the incorporation act was entitled "general," it provided only for the incorporation of companies to manufacture wood, iron, paper, textiles or *salt*, "and articles resulting therefrom." No provision had been made for chemicals, but the section dealing with salt brought the infant corporation within the law.

The company's first patent failed, and so, almost did the company. In 1855, with the aid of more capital advanced by Lewis, and improved processes, they developed a new product, lye for home soap making. Thus the company was saved and put on its way to success.

In 1865, Pennsalt, as it is now familiarly known, began importing cryolite from Greenland as a raw material for the manufacture of lye and sulphate of alumina for use in the paper industry—and for water treatment. In 1872, Pennsalt expanded from its original plant at Natrona, Pa., near Pittsburgh, and built a plant in Philadelpha. In 1886 Hall discovered that aluminum could be made in a bath of molten cryolite, and two years later Pennsalt took part in the birth of a new industry, setting up facilities to supply raw materials to the Pittsburgh Reduction Co., now Alcoa. The year 1900 saw Pennsalt build a new plant at Wyandotte, Mich., to manufacture alkalies electrolytically from salt. Here the first steam turbine used in American industry was installed in 1902. Two years later Arthur E. Gibbs, young British engineer, brought to this plant his invention consisting of a successful electrolytic cell.

In 1908, Dr. F. N. Hirschland, searching for a source of chlorine for his new company, the Goldschmidt Detinning Co., of Carteret, N.J., noticed the sign on Pennsalt's fence as he was passing through Wyandotte on an interurban trolley. Hirschland's company became Pennsalt's first large outlet for the chlorine output of the Gibbs cells. And, after setting up a liquefaction plant on its Wyandotte property, Pennsalt shipped out the first tank car of liquid chlorine ever to move on American rails.

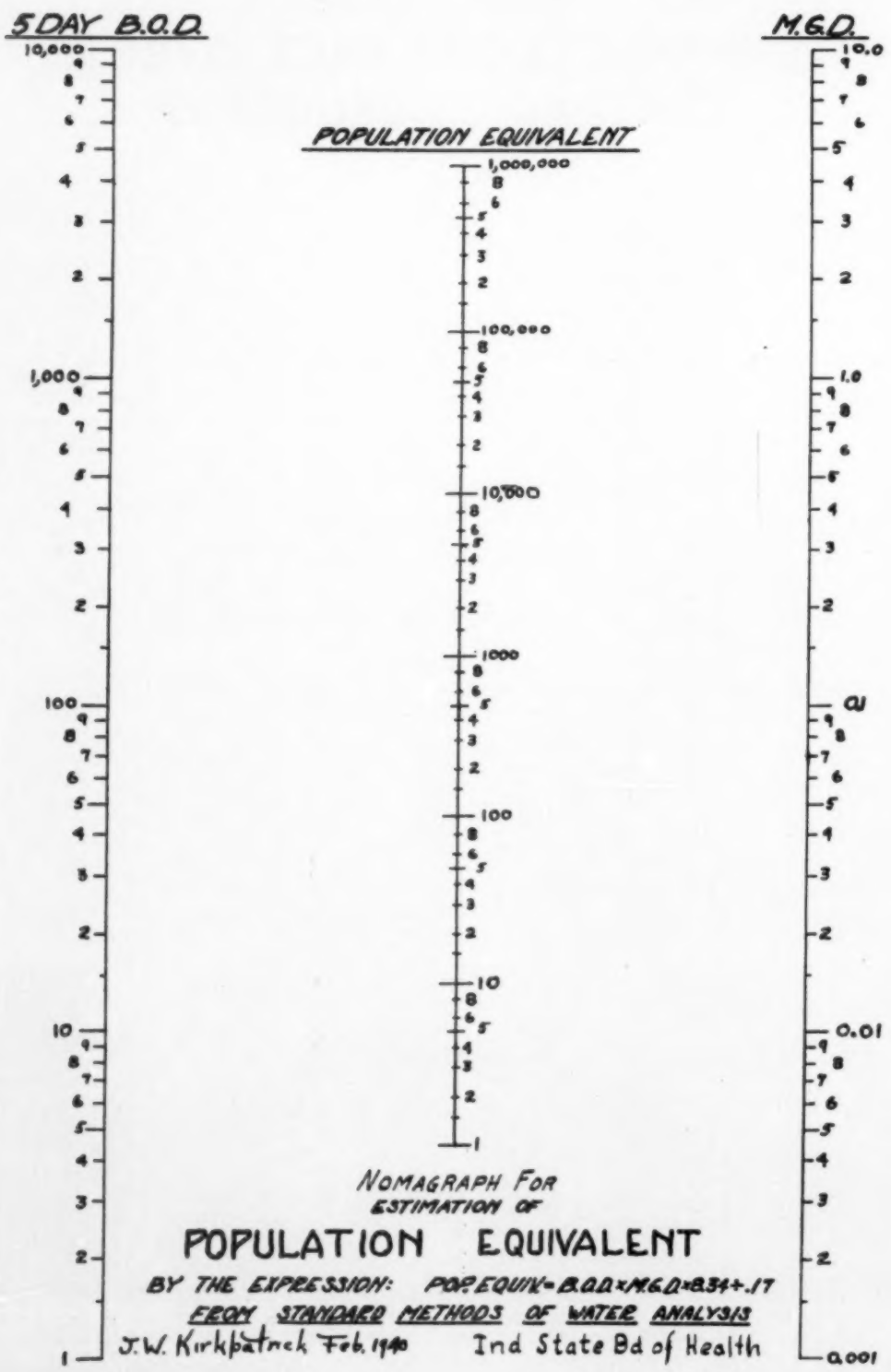
In 1924, Pennsalt chemists worked out a successful method for direct chlorination of paper pulp. Long standing interest in pulp and paper influenced the company to build a plant at Tacoma, Wash., in 1927. In 1929 the company entered the dairy sanitation field with its "Perchloron" and "B.K." products, and soon thereafter was also producing products for laundries, metal cleaning and agricultural pest control. By the beginning of World War II, it had expanded its laundry and drycleaning products and flourine chemicals; had begun production of chlorates in a new plant at Portland, Ore., and had greatly increased its manufacturing facilities and the number of products, including anhydrous ferric chloride.

War also brought intensive expansion of research activities. In 1944 Pennsalt purchased "Whitemarsh," the large mansion built by E. T. Stotesbury in Chestnut Hill, near Philadelphia, and converted it into a beautiful and comfortable research and development laboratory. As a result of its research program, Pennsalt has lately developed a successful electrolytic cell for generation of elemental flourine and in 1947 became the first American chemical company to produce for commercial sales this most chemically active element known.

This year marks the 100th anniversary of the founding of the company.

Pennsalt's Research Laboratories, Chestnut Hill, Pa.

("Whitemarsh," the former home of E. T. Stotesbury was purchased from the Stotesbury Estate and converted into laboratories.)



NOMAGRAPH FOR
ESTIMATION OF

POPULATION EQUIVALENT

BY THE EXPRESSION: POP. EQUIV. = B.O.D. × M.G.D. × 8.34 + .17

FROM STANDARD METHODS OF WATER ANALYSIS

J.W. Kirkpatrick Feb. 1940 Ind State Bd of Health

Congratulations

TO THE CITY OF LOS ANGELES
ON THE OPENING OF THE

HYPERION PLANT

We salute the city which sponsored and the men who planned and built the Hyperion Activated Sludge Plant. One of the world's largest, it typifies progressive, modern Sewage Treatment design and construction. We are proud that CHICAGO Sewage Equipment is playing such an important part in its operation, as it is in thousands of other plants all over the world.

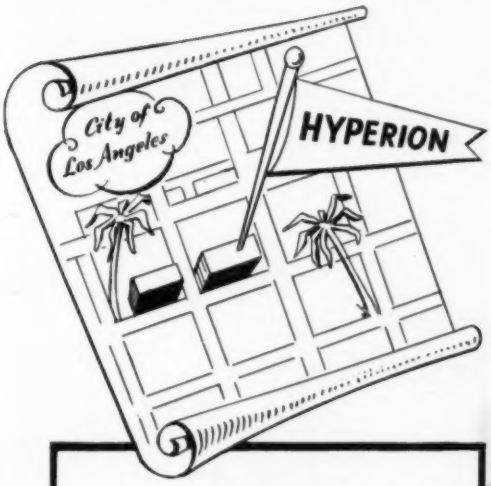
Congratulations

TO THE MEN WHO BUILT
HYPERION

THE BOARD OF PUBLIC WORKS,
CITY OF LOS ANGELES

- Lloyd Aldrich, *City Engineer*
- Merrill Butler, *Deputy Engineer*
- G. A. Parks, *Senior Engineer in Charge of Treatment Plant Design . . . Presently Chief Engineer, Plant Operation*
- F. M. Darnell, *Senior Engineer in Charge of Administration*

Metcalf & Eddy,
Frank L. Flood, *Consultant*



SOME OF THE

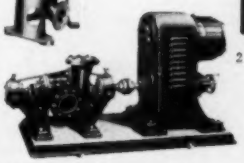
CHICAGO

Sewage Equipment
Supplied for HYPERION

850 Swing Diffusers and
19,531 Precision Diffusion Tubes

12 Non-Clog Pumps

2 26A Comminutors



27 Scru-Peller Sludge Pumps

22 Bilge Pumps and Miscellaneous Circulating Pumps

CHICAGO PUMP COMPANY

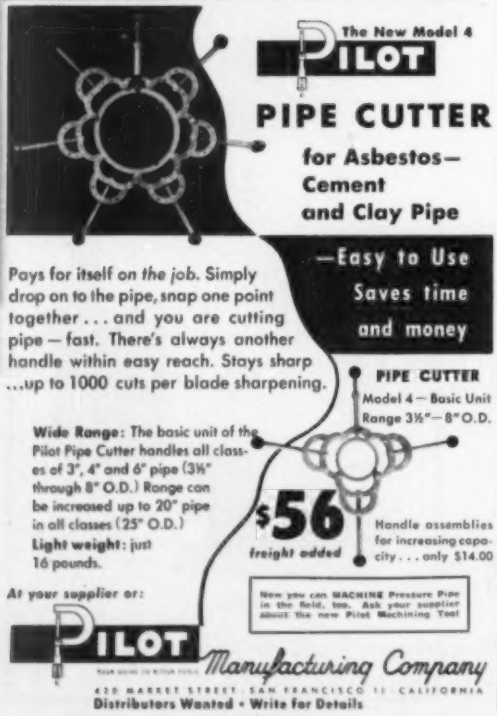
SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Flush Elcos, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

GOLDAK'S great 2 in 1 value!
THE
Dualtronic*
COMBINATION
PIPE LOCATOR and
LEAK DETECTOR
You demanded it! Goldak produced it! The "Dualtronic"... an electronic instrument that does the work of 2 machines effectively and efficiently. One man simple operation! Ruggedly built! Lightweight! Guaranteed!
Write for FREE literature.
The GOLDAK Co.
Leading Makers of PIPE LOCATORS
1543 W. Glenoaks Blvd.
Glendale 1, California


The New Model 4
PILOT
PIPE CUTTER
for Asbestos—
Cement
and Clay Pipe
—Easy to Use
Saves time
and money
Pays for itself on the job. Simply drop on to the pipe, snap one point together... and you are cutting pipe—fast. There's always another handle within easy reach. Stays sharp ...up to 1000 cuts per blade sharpening.
PIPE CUTTER
Model 4—Basic Unit
Range 3⅛"—8" O.D.
Wide Range: The basic unit of the Pilot Pipe Cutter handles all classes of 3", 4" and 6" pipe (3⅛" through 8" O.D.) Range can be increased up to 20" pipe in all classes (25" O.D.)
Light weight: just 16 pounds.
$56
freight added
Handle assemblies for increasing capacity... only $14.00
At your supplier or:
Now you can MACHINE Pressure Pipe in the field, too. Ask your supplier about the new Pilot Machining Tool
PILOT
Manufacturing Company
420 MARKET STREET · SAN FRANCISCO 11 · CALIFORNIA
Distributors Wanted • Write for Details

MEETINGS SCHEDULED:

DEC. 13—BREWER, ME.
Maine Water Utilities Association. Sec'y, Earle A. Tarr, Supt., Winthrop, Me.

DEC. 21—BOSTON, MASS. (Hotel Statler)
New England Water Works Assn. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

JAN. 16, 1951—NEW YORK CITY, N.Y. (Park Sheraton Hotel)
New York Section A.W.W.A. (Mid-Winter Luncheon 12:00 Noon). Sec'y, Rollo K. Blanchard, 50 West 50th Street, New York, N. Y.

JAN. 19-20—NEW YORK CITY, N.Y. (Hotel Statler)
New York Sewage & Industrial Wastes Assn. Sec'y, R. C. Sweeney, 21 No. Broadway, White Plains, N. Y.

FEB. 5-8—ANN ARBOR, MICH. (University of Michigan)
Inservice Training Course in Radiological Health. Director, H. E. Miller, School of Public Health, Univ. of Michigan, Ann Arbor, Mich.

FEB. 7-9—INDIANAPOLIS, IND. (Lincoln Hotel)
Indiana Section A.W.W.A. Sec'y, G. C. Fassnacht, State Board of Health, 1098 W. Michigan St., Indianapolis 7, Ind.

FEB. 15-16—ANN ARBOR, MICH. (Univ. of Michigan, School of Public Health)
Water Works Problems. The 3rd Inservice Training Course given in cooperation with the Michigan Section A.W.W.A. Dir., H. E. Miller, School of Public Health, Univ., of Michigan, Ann Arbor, Mich. (Enrollment Fee—$5.00)

FEB. 21-23—W. LAFAYETTE, IND. (Purdue Univ., Memorial Union)
6th Purdue Industrial Waste Conference. Chairman, Don. E. Bloodgood, Prof. San. Eng., Purdue Univ., W. Lafayette, Ind.

MAR. 13-16—NEW YORK CITY, N.Y. (Hotel Statler)
National Association of Corrosion Engineers. Exec.-Sec'y, A. B. Campbell, Southern Standard Bldg., Houston, Texas.

MAR. 11-15—COLLEGE STATION, TEXAS (Texas A. & M.)
Texas Water & Sewage Works Association. Sec'y, V. M. Ehlers, 501 West 33rd St., Austin 2, Texas.

APR. 5-6—OLD POINT COMFORT, VA. (Hotel Chamberlain)
Virginia Industrial Wastes & Sewage Works Assn. Sec'y, A. H. Paessler, 815 E. Franklin Street, Richmond 19, Va.

APR. 5-6—ALBANY, N.Y. (Hotel Ten Eyck)
New York Section A.W.W.A. (Spring Meeting). Sec'y, Rollo K. Blanchard, 50 West 50th Street, New York 20, N. Y.

APR. 9-11—HOT SPRINGS, ARK.
Arkansas Water & Sewage Conference. Sec'y, Harrison Hale, University of Arkansas, 118 Chemistry Bldg., Fayetteville, Ark.

APR. 11-13—HAYS, KANSAS
Kansas Section A.W.W.A. Sec'y, H. W. Badley, 640 Highland St., Salina, Kans.
Kansas Sewage Works Association. Sec'y, Dwight F. Metzler, State Board of Health, Univ. of Kansas, Lawrence, Kans.

APR. 19—HELENA, MONT. (Hotel Placer)
Montana Sewage Works Association. Sec'y, H. B. Foote, State Board of Health, Helena, Mont.

APR. 20-21—
Montana Section A.W.W.A. Sec'y, Arthur W. Clarkson, State Board of Health, 1036—8th Ave., Helena, Mont.

APR. 25-28—FRESNO, CALIF. (Hotel California)
California Sewage Works Association. Sec'y, Lawrence H. Cook, Box 696 Menlo Park, Calif.

APR. 29-MAY 4—MIAMI, FLA. (Reservation Announcement Dec. 1st.)
American Water Works Association. (Annual Convention). Exec.-Sec'y, Harry E. Jordan, 500 Fifth Avenue, New York 19, N. Y.

MAY 21-23—WINNIPEG, MAN. CAN. (Alexandria Hotel)
Canadian Section A.W.W.A. Sec'y, Dr. A. E. Berry, Ontario Department of Health, Parliament Buildings, Toronto, Ont.

JUNE 7-8—SPRINGFIELD, MASS.
New England Sewage & Industrial Wastes Assn. Sec'y, Walter E. Merrill, State Dept. of Health, 511A State House, Boston, Mass.
(Joint Meeting)
New York Sewage & Industrial Wastes Assn. Sec'y, Ralph C. Sweeney, 21 N. Broadway, White Plains, N. Y.

"Boy! Was that Commissioner impressed!"

"Said he didn't think it was possible to raise a gate so easy. Seems that in his town's plant they're forever having trouble with gates sticking and stems breaking. No wonder. On some of his gates there's forty tons' pressure pushing a rusty gate against rusty facing strips. That's friction you just can't beat.

"I told him our Everdur* equipment won't stick because it never rusts. When he said they can't afford to use Everdur, I told him he can't afford *not* to. Proved it, too! Showed him that the little extra it cost was only a fraction of what they were spending on replacements . . . replacements they'd never have had to make if they'd used Everdur in the first place. The Commissioner said he guessed I was right.

"Smart man, that Commissioner." 49171

*Reg. U. S. Pat. Off.

Corrosion is the enemy you can lick by fabricating your equipment with Everdur . . . Anaconda's Copper-Silicon Alloys. Everdur combines the corrosion resistance of copper with high tensile strength. It's available in all wrought commercial shapes; also in casting ingots. It is easy to weld and easy to fabricate.

May we send you more information on Everdur? Do you have a problem on which we can give you technical counsel? Just write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

Where corrosion resistance counts—use Everdur . . . .

ANACONDA

COPPER-SILICON ALLOYS

YOUR PIPE DREAMS COME TRUE WITH

CARLON

The first real pipe that is plastic!

For a first time, the features of **flexibility, light weight** and **absolute corrosion resistance** are combined in one pipe that has been developed to solve water and sewage transmission problems.

Because of CARLON'S flexibility, lightweight and corrosion resistance, longer service life is assured . . . shipping costs are minimized . . . fewer fittings are required . . . and long lengths of pipe can be installed rapidly and easily at low cost. CARLON pipe will curve to follow ditch line or surface contour. In many applications, one man can lay long sections of CARLON pipe without additional aid, and then make connections in as little as 2 minutes each.

Your pipe dreams become a reality when you SPECIFY CARLON PLASTIC PIPE. Write today for complete catalog, or call BRoadway 1-6565 for immediate service.

Specify the Pipe with the Stripe!

CARLON "EP" PIPE

NOM. PIPE SIZE	O.D.	I.D.	EST'D B.P. P.S.I.	WT PER FT	NORMAL SHPG. LENGTHS
½"	0.840	0.622	540	0.103	400 ft coils
¾"	1.050	0.824	350	0.140	400 ft coils
1"	1.310	1.070	280	0.181	300 ft coils
1¼"	1.660	1.380	300	0.267	300 ft coils
1½"	1.900	1.610	200	0.320	230 ft coils
2"	2.378	2.070	170	0.443	200 ft coils
2½"	2.875	2.469	170	0.68	200 ft coils
3"	3.504	3.070	163	0.91	100 ft coils
4"	4.504	4.030	150	1.23	25 ft str
6"	6.630	6.070	115	2.23	25 ft str

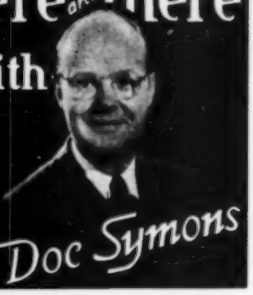
Identification Stripe WHITE—Standard Pipe
RED —Heavy-duty Pipe

CARLON CP

CARTER PRODUCTS CORPORATION

19132 Meech Avenue
CLEVELAND 5, OHIO

Here and There with Doc Symons



Here's That Man Again—And inasmuch as this is the last issue in the year of 1950, I've decided to catch up on a lot of left-over material that hasn't run; and that includes a number of letters.—This means that we'll start the new year out with stories about the Federation Meeting in Washington, and I have some good ones.

* * *

For those of you who thought I was kidding about the B.O.D. Trade Mark in Lewisburg, Pa., here's proof from the local newspaper of that fair city, the home of the Bucknell Buffaloes.

PLUMBING AND HEATING TRADE B.O.D. MARK B·O·DAUBERT LEWISBURG, PENNA.

* * *

Special Announcement—This is to let you know that I have become Charter Member No. 10 of the AWWA Beanie Club of Wisconsin. Naturally the president of the club is Zenno A. Gorder, Director of Public Works of Monroe, Wis., the Swiss Cheese Capital of the Country.

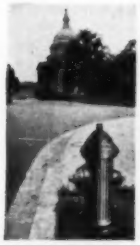
Obligations of members are that they must be cheese lovers—and who doesn't know that I always welcome a piece of aged cheddar or swiss—and members must also wear their imported black velvet Swiss Beanies at Conventions. Look for 'em—I'll be wearing mine.

* * *

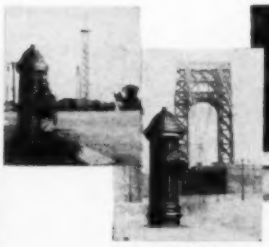
Many of you liked the brand of humor which W. F. Schaphorst, Mechanical Engineer, of Newark, N.J. displayed recently in this column. (Mr. Schaphorst is the gentleman who contributes so many of those handy

(*Continued on page* 84A)

Many are the reasons why Smith hydrants are used by America's leading cities



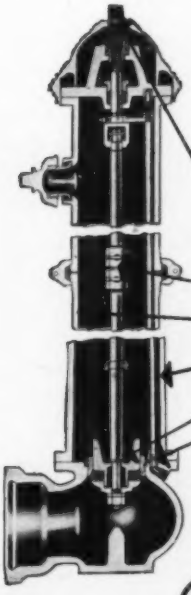
Capitol Building, Wash., D. C.



George Washington Bridge, N. Y.

Independence Hall, Phila.

Empire State Bldg., N. Y.



New York—Philadelphia—Washington—Baltimore—St. Louis—Providence and scores of other cities throughout the nation use SMITH hydrants—and not without good reason. A few of these reasons can easily be seen upon inspection of the hydrant section shown at the left.

1 Working parts easily removed from top.
2 Frangible couplings for collision protection.
3 Maximum flow due to large stand pipe areas.
4 Tapered, frost-proof barrel
5 Compression-type valve.
6 Positive action drain—always closed when main valve is open.

51

GATE VALVES
CHECK VALVES
FIRE HYDRANTS
INSERTING VALVES
TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.
ESTABLISHED 1874
EAST ORANGE, NEW JERSEY

FLOOR STANDS
INDICATOR POSTS
TAPPING MACHINES
INSERTING MACHINES
PIPE CUTTING MACHINES
CORPORATION TAPPING MACHINES

(*Continued from page 82A*)

gadgets and nomographs.) Here's another contribution from him:—

"The wives of instructors at the University of Illinois were meeting for a faculty tea. They would introduce themselves in this manner: 'My name is Schreitmueller,' said Mrs. Schreitmueller to another lady who replied, 'My name is Dutcher.'—'For heaven's sakes, what is it?', shrieked Mrs. Schreitmueller."

* * *

WATER WORKS ROMANCE No. 13—Speaking of the Society of Council Bluffers—reminds me that right in that august organization in addition to all of the brass hats who have served the AWWA or the WSWMA as President, we have a water works romance story.

A number of years ago, when Everett Maxwell Jones went to work for the Simplex Valve and Meter Co. (known in the C.B.'s as the Complex Valve and Spigot Co.), he was assigned a very cute and pretty secretary who had been with the company for about a month.—The rest is history—E. M. (Casey, for it was he) went on to become Vice President and Gen. Mgr. of the company and the secretary went onto his knee as Mrs. "Casey" (Dot) Jones.

* * *

Back to Poland Spring, Me. for a moment—The Society of Council Bluffers got together before dinner one evening and counted up three active members and three associate members—The associates being Reg and Buelah (Hydratite) Hayes of Medford, Mass., "Gin" Symons of Larchmont, N.Y., and the actives were Dan and Lil (Permutit) Saunders of Kew Gardens, L.I., N.Y., and V.T.Y.

I tried to get a couple of pictures but this time my camera *really* was on the fritz and so I only came out with this one which purports to show the Hayes and the Saunders.

* * *

Down Cincinnati way last June, I took a couple of pictures of some awfully nice people. Unfortunately, when the story of that meeting was published in the October issue, there

The Two Mrs. Backherms

On the left Mrs. Louis E. (Consultant), and on the right Mrs. A. B. (Prin. Engr. of Cincinnati).

The Robt. Bowmans

(With apologies to one daughter who almost didn't get into the picture—Reason—Poor cameraman!)

(*Continued on page 86A*)

The NOSE KNOWS THE DIFFERENCE

Chlorinators should be seen but not smelled. Builders Visible Flow Chlorinizers are completely free from tray-produced chlorine gas odors. These efficient chlorine gas feeders are a welcome addition to any plant or process where chlorination is required. They work safely, accurately, dependably — *without the nuisance of offensive chlorine odors!* That's because fresh water is constantly supplied to the tray, drawn into the injector, and then delivered to the point of application.

BUILDERS CHLORINIZERS GIVE YOU THESE EXTRA FEATURES:

- no "ice" in vital control parts
- accurate Sightflo chlorine rate indicator
- visible and positive evidence of vacuum and flow
- long life chlorine control valve
- no tray-produced chlorine odors
- powerful, spring-loaded shut-off valve

For engineering information and Bulletins, address Builders-Providence, Inc., (Division of Builders Iron Foundry), 350 Harris Ave., Providence 1, R. I.

BUILDERS PRODUCTS: The Venturi Meter • Proportio and Orifice Meters • Kennison Nozzles • Venturi Filter Controllers and Gauges • Conveyoflo Meters • Type M and Flo-Watch Instruments • Wheeler Filter Bottoms • Master Controllers • Chlorinizers—Chlorine Gas Feeders • Filter Operating Tables • Manometers • Chronoflo Telemeters

Model DVSX

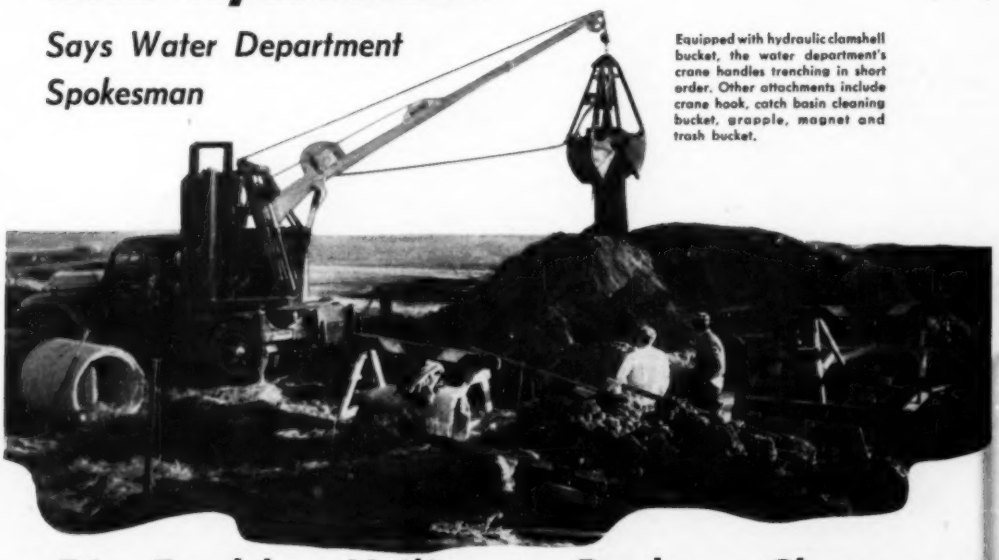
Model CVS

Installation at R. I. State Prison, Howard, R. I.

BUILDERS PROVIDENCE Instruments

Leaks repaired three times faster with Hydrocrane

Says Water Department Spokesman



Equipped with hydraulic clamshell bucket, the water department's crane handles trenching in short order. Other attachments include crane hook, catch basin cleaning bucket, grapple, magnet and trash bucket.

Rig Enables Utility to Reduce Charges

"Water main and hydrant leaks are repaired three times faster since we use a Hydrocrane," reports Elmer L. Nordness, Asst. Supt. of the Madison, Wis. Water Dept. "An average repair took five men a whole day—now three men and a Hydrocrane do the job in less than three hours. Even in these days of rising costs we reduced water service installation charges because of the Hydrocrane's cost-cutting speed."

Repair Men Don't Mind Leak Work Now

No more heavy rubber trench boots . . . no more slippery, dangerous footing . . . no more heavy, sticky mud on shovels — a few reasons why repair men are happy since the department modernized with a Hydrocrane. Also, the crane loads directly from ditch to truck. Workmen used to shovel mud onto the street, then into trucks — a slow expensive method.

"Telescoping Boom Sold Us"

"Often on stop valve repair or in replacing hydrants we must work next to poles and under overhanging branches," Nordness remarked. "In these spots the telescoping boom has a tremendous advantage. This feature was the real clincher that sold us on the Hydrocrane."

Busy All The Time

The department's two cranes (they recently purchased a new H-3) are busy every day — repairing leaks . . . digging manholes, meter pits and ditches . . . loading, unloading, and setting pipe . . . handling fittings . . . and for general yard work. By using it to haul pipe carrying trailers to the job, the department eliminates an extra truck.

Two Hydrocrane sizes — ¼ yd. 2-ton; ⅜ yd. 3-ton. Send the coupon for full details.

BUCYRUS ERIE HYDROCRANE
South Milwaukee, Wisconsin

BUCYRUS-ERIE HYDROCRANE DIVISION
South Milwaukee, Wisconsin

Gentlemen: Tell me how the Hydrocrane can speed up my jobs.

Name.....

Company.....

Address.....

City..... State.....

BUHSD

(*Continued from page* 84A)

wasn't room to include the pictures so I give them to you now with the captions as they were to have been in that report on the OS&IWTC.

P.S.—"Bob" Bowman was the retiring president of the OS&IWTC and he hails from Findlay, Ohio.

* * *

This past summer, our family succumbed to the lure of television—It was watching the Brooklyn Dodgers on a neighbor's set that did it. Since becoming the owner of a set, I've done a bit of dialing around to see what all the fuss is about. One program intrigues me. Coming on late at night, known as Broadway Open House, and featuring Jerry Lester, it has some remarkable things about it besides Jerry's Bean Bag Club.

Advertising as it does, Ruppert's Beer, one of the commercials carries the picture of a man evidencing "That Ruppert Smile of Pleasure" after taking a drink from the bottle—And I swear that the fellow in the ad. movie is none other than "Gerry" Manahan, Gen. Sales Mgr. of the A. P. Smith Co., of East Orange, N.J.

I confronted "Gerry" (not "Jerry") up at Poland Spring and he said he was *not* doubling as a television actor, but he "surely do" look like it. Another Look-Alike on that program is "Jerry" Lester, himself, who looks an awful lot like "Rollie" (Omega Sales Mgr.) Leveque—And speaking of Look-Alikes, did you ever notice how much Nellie (Mrs. Rollie) Leveque looks like the Duchess of Windsor—so much so that folks up at Poland Spring were calling her Duchess.

One other thing about that Jerry Lester show—he has a new expression for anything that is O.K., but good, extra fancy, etc.—to him, it's GEORGE, pronounced GAWRGE and if any thing or person is extra special, it's "George All The Way." —Of course, I'm too modest to remind you of my first name.

* * *

Here's a picture I picked up at the NEWWA Meeting in Poland Spring, last Sept.; shows the officers: Dore, Anthony, Camp, and Almquist.—Stanley Dore, Dept. Chief Engr., Allegheny Co. San. Auth., Pittsburgh, Pa.; Tom Camp, Boston Cons. Engr.; and Fred. O. A. Almquist, Prin. San. Engr., Conn. Health Dept., Hartford; are all positively beaming, but retiring Prexy Sid (Augusta, Me. Water Supt.) Anthony seems a little sad that he has to give up the gavel.—Or was it the fact that the ever charming and delightful Mrs. Sid wasn't able to come to the meeting?—We missed her too, Sid.

* * *

And Oh Yes—let's close out this hat business before the end of the year—Shall we, Harry Faber??

I don't know why we should make a fuss about a little hat—after all a hat is only something to—

—take off in elevators
—chase on windy days
—buy back from hat check girls
—bang out of shape when you enter an automobile
—and to be thrown away too soon, because your wife says you need a new one.

* * *

I have some more pix from the Poland Spring Meeting and a number of shots of members of the Wisc. AWWA Beanie Club—Sorry, they'll have to wait until 1951.—Right now I want to be the first to wish you a Merry Christmas.

V.T.Y.—Doc.

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

The long established line of M & H Standard Compression type Fire Hydrants is now available with Standardized Mechanical Joint end connection, for use with Cast Iron Pipe.

Mechanical Joint features are: Ease and speed of installation, construction economy, joint deflection, leak-tight, long life. Used with AWWA Class A, B, C, D; Federal Spec. WW-P-421; or Class 100, 150, 200, 250, centrifugal pipe.

M & H Hydrants can be supplied in accordance with AWWA specifications, or Underwriters Laboratories and Associated Factory Mutuals Laboratories tested and approved.

WRITE FOR CIRCULAR 49

Our New Circular No. 49 shows important installation dimensions of M & H AWWA Mechanical Joint Hydrants and Valves. . . . Underwriters and Associated Factory Mutual approved Mechanical Joint Post Indicator Valves . . . and Mechanical Joint Cutting-In Sleeves.

M&H Products—Everywhere

Less Infiltration

TRANSITE* SEWER PIPE offers two basic safeguards that minimize infiltration in sewer lines: *tighter* joints and *fewer* joints.

Transite's special sleeve-type joints make up tight and stay tight in service.
Its long 13-foot lengths reduce the number of joints in the system.

These safeguards cut down the volume usually allowed for infiltration, reducing sewage load on the treatment plant and conserving plant capacity for future needs. Where new treatment facilities are planned, this reduced infiltration may permit consideration of a smaller plant with resulting economies.

Other Transite Economies—Transite's long lengths help maintain uniform grades; fewer joints reduce turbulence in the line. These advantages, added to Transite's unusually smooth interior, mean better flow qualities (Kutter's n=.010). This often permits designing the system with flatter grades and shallower trenches. Or, as an alternate economy, pipe of smaller diameter may be specified.

Transite Sewer Pipe is made of asbestos, cement and silica by a special manufacturing process that employs steam curing to develop greater corrosion resistance and strength. It is available in four strength classes in sizes to 36", permitting selection of the pipe best suited to trench conditions, and frequently eliminating the need for concrete cradles.

For further details, write Johns-Manville, Box 290, New York 16, N. Y.

*Transite is a Johns-Manville registered trade mark

.....Johns-Manville

TRANSITE SEWER PIPE...

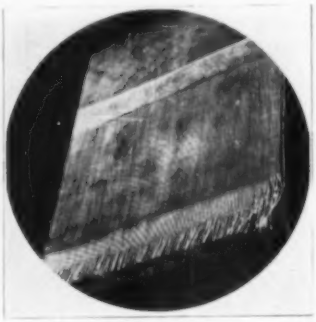
MANUFACTURERS' and EQUIPMENT NEWS

1

"Controlled Stretch" Featured In New Belt

S. R. Sikes Co., Minneapolis, Minn., has recently developed a new flat leather belt with "Controlled Stretch" that prevents permanent elongation of the belt under load and thereby eliminates slipping.

The non-stretching advantage of a fabric belting and the greater pulley grip of leather are combined in this new belting. Called "Cordan," this new leather belting is reinforced with synthetic cords placed between the leather plys by a special process perfected by the company. These cords provide the added resiliency necessary to prevent the leather from stretching beyond a certain point under load and to return the belt to its true length when not under load.



According to the manufacturer this eliminates slippage which reduces power loss, belt damaging friction and frequent shut-downs for adjusting or shortening the belt.

Johnston Pump Appoints New V.P.'s

Johnston Pump Co., Los Angeles, Calif., at the last Board of Directors meeting, announced that Kenneth G. Lundie was elected Vice-President in charge of sales, and Perry Brown was elected Vice-President in charge of engineering, according to Thomas W. Simmons, President.

Brown was chief engineer at Johnston and Lundie was sales manager. Both men have been in the vertical turbine pump industry for many years.

2

New Blow Torch

Otto Bernz Co., Rochester, N.Y., recently announced a new style blow torch. According to the company this is the first basic style change in blow torch construction in 75 years. The new redesigned aluminum-tank torch weighs only slightly over two pounds, thus making it 40 per cent lighter than old style torches.

Bernz states that filling the new, lightweight torch requires no special tools and a lock on the stuffing box nut prevents "backing out" of valve on the burner—a significant safety factor.

Peebles Dresser's So. East Rep.

Dresser Manufacturing Div., Bradford, Pa., has announced the appointment of Henry F. Peebles as Southeastern Representative. Mr.

(Continued on page 90A)

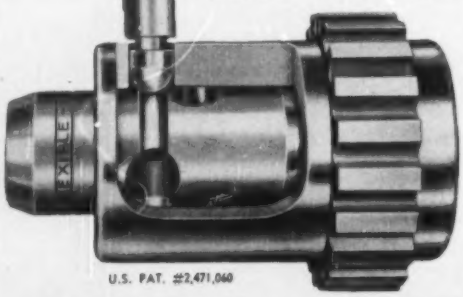
NEW "FLEXIBLE" COUPLING

Cut-away above shows compartments into which each elbow bend fits

U.S. PAT. #2,110,202

New "Flexible" couplings are completely interchangeable with all "Flexible" couplings made in the last 15 years

LOCK PIN LOCATOR



U.S. PAT. #2,471,060

Simply move coupling in or out of ratchet or power drive shaft, and press point of pin down until it clicks. Then turn right or left for hole. What could be easier?

Redesigned for faster, simpler, time-saving coupling-up. Impossible now to couple into lock pin hole. Rods cannot come apart in sewer line.

WRITE TODAY FOR ILLUSTRATED LITERATURE

FLEXIBLE SEWER-ROD EQUIPMENT COMPANY

9059 Venice Blvd., Los Angeles 34, California

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

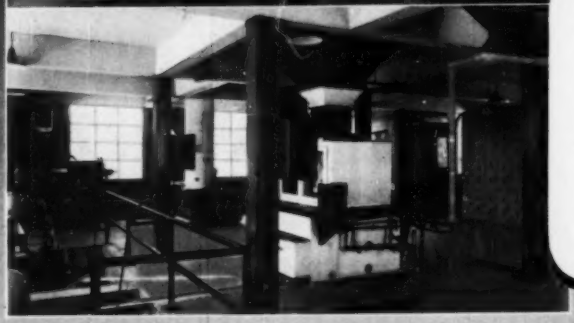
BUCYRUS, OHIO

Water Treatment Plant

(COMPLETED IN 1950)

FLOYD G. BROWNE
& ASSOCIATES
Consulting Engineers
Marion, Ohio

RICHLAND CONSTRUCTION COMPANY
Mansfield, Ohio



Omega Equipment furnished for the Bucyrus Water Treatment Plant:

1 — Universal Feeder No. 1, with hopper agitator and stainless steel weir tank; for hydrated lime.

1 — Universal Feeder No. 2, with stainless steel weir tank, for lime.

1 — Universal Feeder No. 2, with dissolving chamber and extension hopper, for alum or soda ash.

1 — Belt Type Gravimetric Feeder with lime slaker, bin gate, and flow splitter.

Today the modern water works of Bucyrus, Ohio, bears little resemblance to the original system of 1883 which pumped water directly from the Sandusky River into wooden mains. A continuing program of major water system improvements was brought to completion in 1950 when this new water treatment plant was put in operation.

With the new plant, the city now varies its treatment process to accommodate seasonal fluctuations in the quality of raw water. Present capacity is 4MGD; final effluent is of controlled purity and taste. An Omega Gravimetric lime feeder and slaker, handling pebble lime from a 60 ton hopper, performs an essential part of the treatment process. Also employed are Omega Universal Feeders, mounted on weigh scales, to feed hydrated lime, alum, soda ash, and activated carbon.

For information and Bulletins describing Omega Feeders, address Omega Machine Company (Division of Builders Iron Foundry), Providence 1, R. I.

THE LAST WORD IN FEEDERS
OMEGA

(*Continued from page 88A*)

H. Z. Hight, Sales Manager, stated that Mr. Peebles will work with Dresser customers in the states of Fla., Ga., N.C., S.C., Ky., Miss., Vir., Ala., Tenn., and with certain customers in Indiana. Mr. Peebles has been with Dresser approximately two years. A veteran of four and one-half years in the navy, he graduated from Rice with a Mechanical Engineering degree in 1948 and then went to work for the Magnolia Petroleum Co., in Beaumont, Texas, as a Refining Engineer.

3

Packaged Power Unit

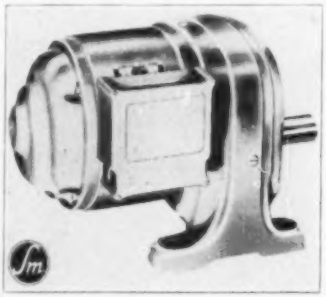
Link-Belt Co., Chicago, Ill., has announced that it has developed a new packaged power unit, called Link-Belt Motogear, consisting of a compact, enclosed helical gear drive with separate standard motor, flexibly coupled and mounted on one welded steel base plate. Built in a variety of sizes, double or triple reductions are provided as well as a wide range of ratios and horsepowers. Input and output shafts are concentrically in line.

The helical gear drive used on Motogears is also available as a separate self-contained unit without the motor.

4

Single Phase-Capacitor Type Motors

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced that their Slo-Speed Geared Electric Power Drives are now available in the single phase, capacitor type design.



These new motors are built with single or double reduction gears, providing speeds from 780 to 30 rpm., in ratings one-half to 3 hp. inclusive. They also utilize a newly designed starting relay that eliminates the necessity of centrifugal switches or any rotating devices such as throw out switches, commutators, brushes, etc.

Sterimine

A New Sterilizing Compound

Sterimine is a new Wallace & Tiernan product developed primarily for the control of microorganism growth in resinous and mineral ion exchange beds. This compound was perfected after two years of cooperative work by Culligan Zeolite Co., Rohm & Haas Co., and Wallace & Tiernan Co., and is now manufactured by the last named company. Introduced in the early part of 1949, Sterimine has performed outstandingly by improving the operating characteristics of ion exchange units on many installations.

Sterimine was developed to provide an economical, effective and safe method for disinfecting synthetic resinous zeolites. These resinous materials are gradually replacing the older inorganic silicious zeolites (greensands, etc.) because of their greater capacity, selectivity, and versatility. The fact that the hypochlorites previously used for disinfection of the inorganic exchangers deleteriously affected the synthetic materials in some cases (also did not

(*Continued on page 92A*)

THE SILENT WATCHMAN

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE. P. O. BOX 14
MEMPHIS 1, TENNESSEE

Complete Service for Elevated Water Tanks—
Nation Wide Service—30 Years Experience

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress. On completely reconditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years by Dixie Tank and Bridge Company. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

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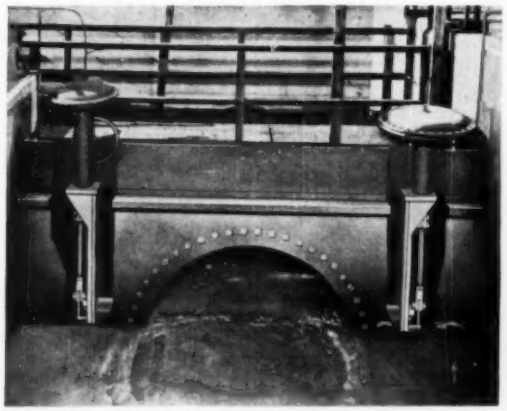
THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



AUTOMATIC CONTROL of Industrial Sewage

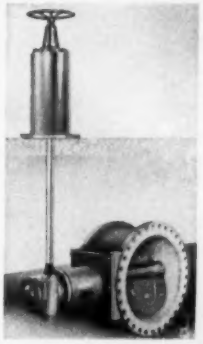
Photograph shows R-S 60-inch Valve discharging sewage from an oil refinery. The valve is operated by means of dual air diaphragm top works and stainless steel linkage, with a handwheel for emergency operation. By means of a level device, the valve is automatically closed at high tide thus eliminating the possibility of flooding the refinery. Valve opens automatically should the air pressure fail. Under emergency conditions or should all power fail, one man can close the valve with a few turns of the handwheel.

R-S Valves are used in air, gas, liquid, steam and semi-solid service in the pressure range from 2 to 2500 psig. They are available in sizes from 2-inches to 72-inches and larger for the simplified control and shut off of volume and pressure.

Consult with your local R-S Valve Engineers or write direct.

R-S PRODUCTS CORPORATION
4600 Germantown Avenue
Philadelphia 44, Pa.

No. 790—Eight-inch Steel Straight Through Slide Valve with pull lever control. Flange on left side when removed permits replacement of slide or cleaning of valve.



No. 788—Fifty-pound Heavy Duty Service Valve with rubber seat. Equipped with totally enclosed gear reduction drive, extended shaft and floor stand.

No. 769—Steel Off-center Relief Valve for low pressure drop. Hand lever can be used as an instrument lever. Counter weight on right side of valve. Relieves at 1 psi differential pressure.

No. 778—Two-inch Threaded End Valve complete with bracket and diaphragm top.

(Continued from page 90A)

satisfactorily sterilize them) spelled the need for a material like Sterimine. Sterimine may also be effectively and economically used on the mineral exchange materials as well as on the resinous media.

Sterimine is a white, free-flowing powder with a slight chlorinous odor. Its sterilizing action is due to the presence of 50% available chlorine. While the chlorine in Sterimine is relatively non-reactive to organic matter, as compared to hypochlorites, it is still effective against microorganisms. The solubility of Sterimine in water is about 300 ppm. available chlorine after sufficient contact, which affords a moderate concentration of chlorine for a prolonged period. Sterimine is stable in storage and presents no difficulties in handling.

Sterimine's uses to date have included treating large resinous softeners used on boiler feed water, treating demineralizer units in the pharmaceutical, radio, television and other fields and in protecting home softener units from microorganism contamination.

Wallace & Tiernan report that extensive tests showed conclusively that for effectiveness and speed of action, for the absence of harmful effects on the ion exchange material, for ease and simplicity of use, for the absence of noxious or toxic effects, for economy of use, and for stability in storage, Sterimine proved far more satisfactory than the hypochlorites, peroxides, quaternary ammonium compounds or the formaldehyde tested.

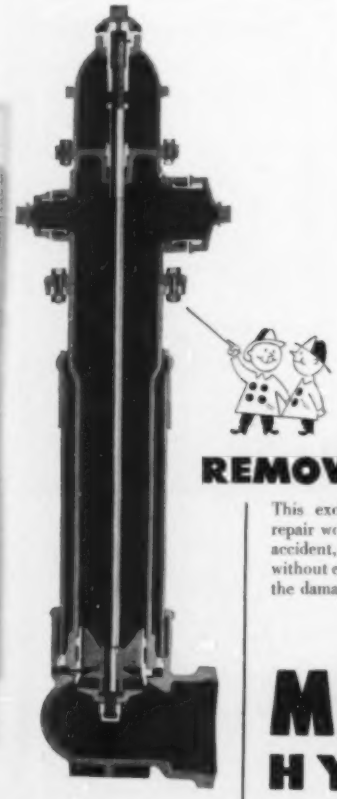
Sterimine owes its greater effectiveness to the fact that it provides for a moderate concentration of chlorine for a prolonged period of time. Being slowly soluble it provides a good residual throughout the majority of the sterilization. We wonder if this new sterilizing compound might not be used also for water main sterilization and the sterilization of joint packings with good effects.

5

Battery Driven Air Compressor

Jet Drain Engineering Co., Saginaw, Mich., has developed a new battery driven air compressor. This

new type compressor, according to the manufacturer, is automatic, portable (weighing approximately 50 lbs.) and is easily connected to, and powered by, a service truck storage battery. The unit is guaranteed to develop over 100 lbs. pressure. It was developed for use in conjunction with the Adams Jet Drain to assure a completely portable, simple hydrant drain. The compressor is designed so it can be used for spray painting, tire inflating, with a pressure grease gun or any application where an air supply is needed, when not in use with the hydrant drain.



REMOVABLE BARREL

This exclusive feature eliminates "on the job" repair work. If a Mathews is the victim of a traffic accident, simply remove the barrel, insert a spare without excavating—a matter of minutes—and take the damaged barrel back to the shop.

MATHEWS HYDRANTS

THE FIREMAN'S FRIEND

Made by R. D. Wood Company
Public Ledger Building, Independence Square
Philadelphia 5, Pa.
Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

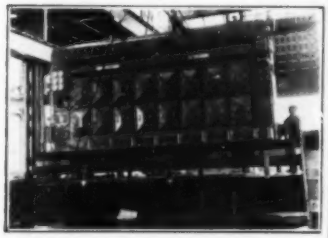
Mathews Modernized Hydrants Set the Pace: All working parts contained in replaceable barrel • Stuffing box cast integral with nozzle section • Head can be turned 360° • Replaceable head • Nozzle sections easily changed • Nozzle levels raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for extra strength, toughness, elasticity • Operating thread only part to be lubricated • A modern barrel makes an old Mathews good as new • Available with mechanical joint pipe connection

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

6

New Diesel Engine for N. Y. Sewage Plant

National Supply Company's Engine Division, Springfield, Ohio, has recently loaded for shipment the first

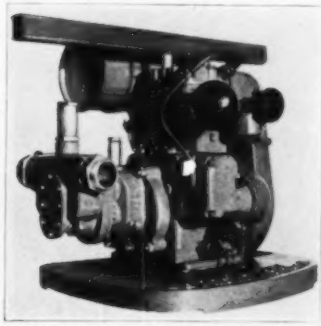


of six 1,300 hp. Superior Diesel engines for New York City's newest and largest sewage plant at Owl's Head Point, Brooklyn. These engines will use either oil or sewage gas as fuel and each engine will drive 900-kw generators which will provide electric power for the new plant.

7

Pressure Testing Pump

Porto Pump, Inc., Detroit, Mich., has made radical changes and developments in its Porto Pump. This rotary, positive displacement, rubber

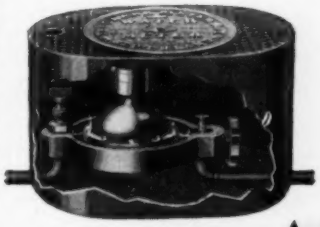


gear pump is especially applicable for pressure testing and chlorinating water mains. The pump is easily carried, simple to operate, dependable and quickly develops required pressure up to 200 lb.

According to the manufacturer this pump has rubber gear construction, pre-lubricated bearings, mechanical seals (no packings), adjustable automatic by-pass valve, 4 cycle engine, and assures maximum trouble-free performance with minimum maintenance and servicing.

CLARK METER BOXES AND COVERS

Left, No. 16 Clark Wonder Lock Meter Box Round....16" and 18" diameters. Large 13" lid.



Above, No. 11 Oval Clark Wonder Lock Meter Box, especially for warmer climates. H-11", L-18", W-12".

Below, A-2-13 Clark Meter Box Cover with screw lock. Height 4", lid opening 13".

Above, A-2-11 Clark Single Lid Meter Box Cover, 4" throat. Also available in 6" and 9" throat.

Below, B-2-11-L Clark Double Lid Meter Box Cover, 6" throat. Also available in 4" and 9" throat.

Above, AA-3-12 Clark Meter Box Cover with 13" Wonder Lock Lid, for use with 15" (illustrated), 18" and 20" box body.

Improved Screw Lock with strong forged bronze bolt.

Wonder Lock Lid (bottom view) showing forged bronze bars.

Perfect Lock of one-piece manganese bronze forging.

write

H. W. CLARK CO.

MATTOON, ILLINOIS

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Austin Joins Norwalk Valve

Norwalk Valve Co., Norwalk, Conn., has announced the appointment of H. R. E. Austin as Sales Manager.

Mr. Austin was formerly President of Austin Mason Co., a New York engineering manufacturing concern, producing metallic packing for all types of gas compressors. He was also midwestern district manager for National Cylinder Gas Co., during which time he pioneered the opening of several National Cylinder plants in a 4-state area during the last war.

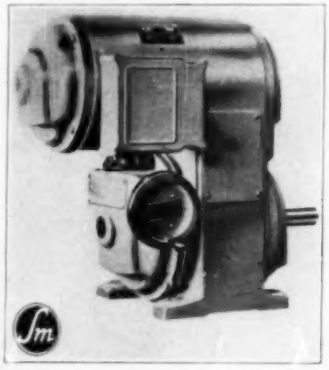
8

Electric Power Drive

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced that their Speed-Trol Electric Power Drives are now available in the single phase capacitor type design.

These new single phase Speed-Trol motors are available in ratings of ½ to 3 hp inclusive, and provide infinite speed variation in practically any given range that might be desired. They have 18 different maximum speeds from 2,000 down to 52 rpm. inclusive. Due to positive adjustment any selected speed is steady and will not vary under fluctuating load conditions.

These new design motors include fingertip speed control, one piece cast



iron drip-proof frame, patented "Herringbone" rotor, vinol-acetal insulated wire stator windings, and standard NEMA mounting dimensions.

A. Y. McDonald Opens Branch in Spencer, Iowa

The A. Y. McDonald Mfg. Co., Dubuque, Iowa, opened a branch in Spencer, Iowa on August 11th, and all dealers in the area to be serviced out of this branch were invited in for an open house and get-together to see the new facilities established for their use.

Robert Storm, who has been with the McDonald organization for several years and has recently moved to Spencer, will be Resident Manager. This new Division is supervised by R. E. Volkert, Manager of the Sioux City zone and is under the overall direction of John M. McDonald, Jr. of Dubuque, Executive Vice-President of A. Y. McDonald Mfg. Co. in charge of Branch House Operations.

9

Electric Control Features Rate Action

Leeds & Northrup Co., Philadelphia, Pa., has announced a new control system that introduces rate action into an electrically-actuated control. According to the company, the significance of rate action is that it responds according to the speed with which the controlled variable changes —and thus improves process output by reducing the length of time that an upset can force the controlled process off its set point.

WARREN
Solves Your
PIPE
PROBLEMS
BELL & SPIGOT PIPE •
FLANGE PIPE •
MECHANICAL JOINT PIPE •
FLEXIBLE JOINT PIPE •
SPECIAL CASTINGS •
SHORT BODY BELL & SPIGOT SPECIALS •
Warren Cast Iron Pipe and Fittings can be supplied in all sizes 2" to 84" with all types of joints and in accordance with Standard Specifications. Specify "Warren Pipe" for your next job.
Take advantage of our large stock of non-standard patterns, when in need of special castings to meet your individual requirements.
Warren
FOUNDRY & PIPE CORP.
55 LIBERTY ST. — N. Y. C.
WARREN PIPE CO. of MASS. INC.
75 FEDERAL ST., Boston, Mass.

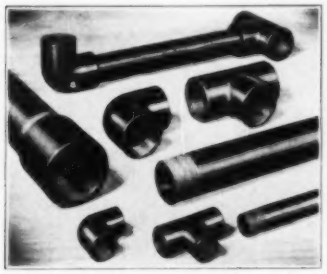
If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

The P.A.T. '50 has proportional and reset control actions, and is applicable to the regulation of temperature, pH, chemical concentration and gas analysis. The new control unit has no moving parts, control action is accomplished by electronic circuits, and valve position can be measured remotely at the control panel without interfering with the control action.

10

Threaded Plastic Pipe

Carlon Products Corp., Cleveland, Ohio, has developed a new plastic pipe which is furnished in threaded sections together with molded plastic



fittings. The pipe, designated Carlon "TL," is furnished in 20 ft. lengths and incorporate standard International Pipe Threads.

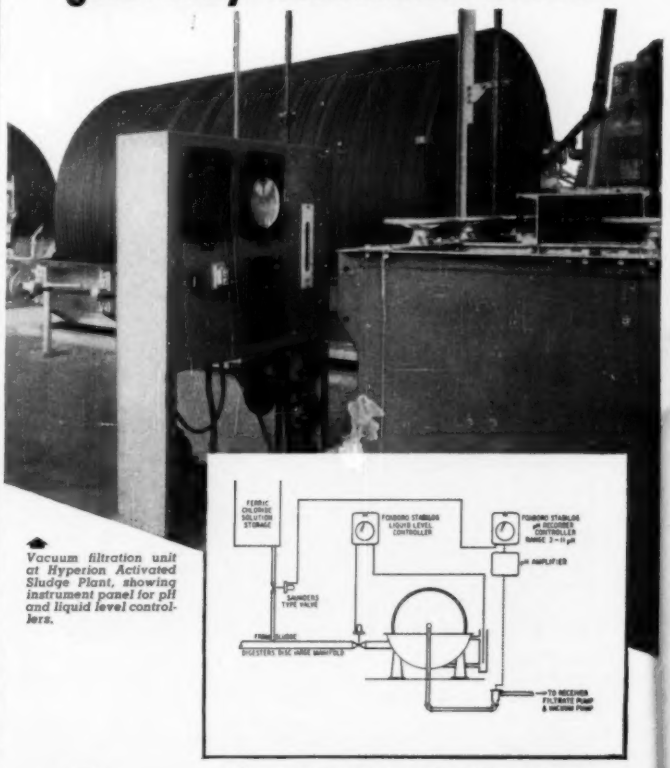
This new pipe can be threaded and cut in the conventional manner with standard pipe-fitting tools, and is furnished in standard pipe diameters of ¼ to 2 in. Because of the inherent pliability of the plastic from which the pipe is extruded, fit-up is more rapid and threaded leak-proof joints are assured.

Atlas Mineral Products Personnel Changes

Announcement has been made by George L. Wirtz, President of the Atlas Mineral Products Co., Mertztown, Pa., of the following personnel changes.

Richard A. Weppner has been appointed Sales Engineer for corrosion-resistant chemical construction materials in Delaware, Maryland, Virginia and parts of West Virginia and New Jersey. Philip E. Berens has been appointed Sales Representative for the same materials in Eastern Pennsylvania, Western New York and parts of New Jersey. William A. Streaker has been appointed Sales Engineer for Atlas Products in lower Michigan, Eastern Indiana and part of Ohio.

New activated sludge plant gets fully automatic control



Vacuum filtration unit at Hyperion Activated Sludge Plant, showing instrument panel for pH and liquid level controllers.

FERRIC CHLORIDE SOLUTION STORAGE
FOXBORO STABLOG LIQUID LEVEL CONTROLLER
FOXBORO STABLOG pH RECORDER CONTROLLER
pH AMPLIFIER
SHARPLES TYPE VALVE
TO RECEIVER FILTRATE PUMP & VACUUM PUMP

Schematic diagram illustrates plan of Hyperion system. This continuous, automatic control prevents upsets due to sudden variations in quality of sludge — as when shifting from one digester to another.

...with Foxboro Instrument System

Los Angeles' new Hyperion Activated Sludge Plant is one of the most modern, efficient sewage treatment installations in the country. Typical of its outstanding features is the Foxboro Pneumatic Control System for sludge de-watering and ferric chloride neutralizing.

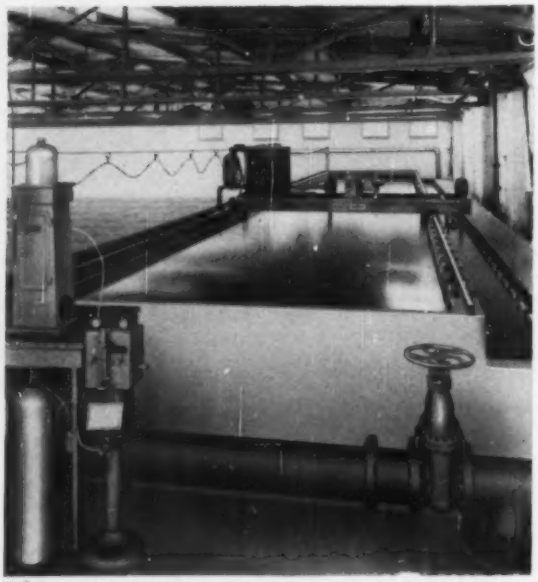
Digested sludge is fed to the filter troughs under automatic control to maintain the exact liquid level for optimum filter operation. Foxboro pH Control regulates the flow of ferric chloride neutralizer into the sludge at a rate determined by the pH measuring head in the outflow duct. The result is improved de-watering, higher filter capacity, and superior filter cake.

Why not investigate the benefits of this vastly more dependable automatic operation of your plant with Foxboro Control? Write **The Foxboro Co., 228 Neponset Ave., Foxboro, Mass., U. S. A.**

FOXBORO RECORDING • CONTROLLING INDICATING INSTRUMENTS

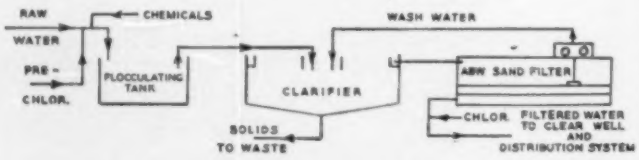
If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

AUTOMATIC BACKWASH FILTERS POPULAR FOR RAW WATER TREATMENT



Hardinge ABW Sand Filter at Newton Falls, N. Y. 90% of the filtered water is used in the processing operations in the Newton Falls Paper Mill—the other 10% is used for the town water supply.

The Hardinge Automatic Backwash Rapid Sand Filter has proven highly satisfactory on industrial as well as municipal water supply systems. In the town of Newton Falls, N. Y., for example, a single Hardinge ABW filter handles both the industrial water supply for the Newton Falls Paper Mill processing operations and the town's water supply. The water produced by this ABW Filter installation contains less than one part per million of suspended solids in spite of the fact that there is no flocculation or pre-sedimentation before filtering.



Write for Bulletin 46-15

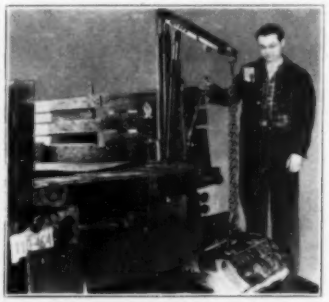
HARDINGE
COMPANY INCORPORATED

YORK, PENNSYLVANIA—240 Arch St. • Main Office and Works
NEW YORK 17—122 E. 42nd St. • 205 W. Wacker Drive—CHICAGO 6
SAN FRANCISCO 11—24 California St. • 200 Bay St.—TORONTO 1

11

¾ Ton Hydraulic Hoist

Unit Manufacturing Co., Minneapolis, Minn., has developed a new hydraulically powered shop or truck hoist. This new "Utility" hoist can



be used on a 3-wheel tubular steel floor frame, or be quickly converted for use on truck beds, work benches or loading docks. It features fast hydraulic operation that will lift a ¾ ton load 77½ in. in 45 seconds and by using a short hook-up 2,000 lbs. can be lifted 52 in. in 45 seconds. A double action, hand operated hydraulic pump powers the "Utility" hoist.

12

Lightweight Cleanout Auger

General Wire Spring Co., Pittsburgh, Pa., offers a quick, convenient cleaner for 3 inch diameter waste and water lines with their new, compact, electric-powered cleanout auger.

Known as "Handyelectric," the new auger operates from any 110V, AC or DC outlet. It is equipped with two 25-ft. snakes, one of ¼ inch diam., and the other of ⅜ inch diam.; a Jacobs hand chuck; 1¼ inch side cutter blades; arrow head drill; boring gimlet; and an aluminum-coated steel snake container. It weighs 14 lbs. with ¼ inch snake. The electric motor is encased in a finger-fit hand grip and has a reverse switch to release snake.

The cone at the front of the tool serves as a fully protected hand grip to guide the snake as it unwinds from the container. With auger snake removed, tool can be used as an electric drill.

J. J. Finnigan Co. Celebrates 62nd Year

J. J. Finnigan Co., Atlanta, Ga., recently celebrated the firm's 62nd year in business. Finnigan, one of Atlanta's oldest concerns, has been in

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

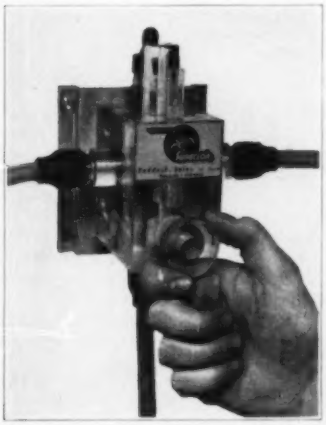
continual operation since 1888—producing boilers, tanks, pressure vessels and industrial power equipment.

Just prior to their anniversary, which was attended by over 250 officials, employees and guests, the company had joined two new buildings to the original structure, adding 10,000 square feet of floor space. This, plus new fabricating equipment, will increase the plant's productive capacity to meet the demand of industry.

13

Water-Energized Chlorinator

Paddock Engineering Co., Dallas, Texas, has developed a low-cost water-energized chlorinator which, according to the manufacturer, is automatic and virtually foolproof.



In cases of emergency, ordinary household bleach (such as Clorox, Purex, etc.) can serve as the source of chlorine for the Sureclor.

Main supply line pressure activates the Sureclor. Part of the water in the main supply line is diverted into it by creating a 50 per cent difference in pressure. This channeled-off water passes through a restricted opening from the high-pressure side. A vacuum is created to draw the additive chlorine solution into the Sureclor to mix thoroughly with the diverted water. The mixture leaves the Sureclor on the low-pressure side and is injected into the main supply line.

14

New Diesel Engine

Baldwin Locomotive Works, Philadelphia, Pa., has announced a new series of diesel engines, ranging in capacity from 700 to 2080 b. hp. Designated as the series 700, these

FOR DEPENDABLE FLOW CONTROL...

Specify KENNEDY Iron-Body Double-Disc Gate Valves for Water Service

Check your Valve requirements against this handy chart: NOTE: 3" thru 48" are all A. W. W. A. Standard

TYPES OF VALVES AVAILABLE—Non-rising Stem and Outside Screw & Yoke

Connections Available	*2"—6"*	*8"—14"*	*16"—24"*	*30"—60"*
Bell Ends	Yes	Yes	Yes	Yes
Screwed	Yes	Yes	No	No
Flanged	Yes	Yes	Yes	Yes
Mechanical Joint	Yes	Yes	No	No
Universal	Yes	Yes	Yes	30" only
Transite	Yes	Yes	Yes	30"-36" only
Spigot Ends	Yes	Yes	Yes	Yes
Combination Ends	Yes	Yes	Yes	Yes
Accessories Available	*2"—6"*	*8"—14"*	*16"—24"*	*30"—60"*
Rollers for Horizontal Operation			Bronze on bronze track	Bronze on bronze track
Stem and Stem Nut	Manganese Bronze 60,000 lb. Tensile strength	Manganese Bronze 60,000 lb. Tensile strength	Manganese Bronze 60,000 lb. Tensile strength	Manganese Bronze 80,000 lb. Tensile strength
By-Pass			available	available
Spur Gears			available	available
Bevel Gears			available	Standard
Gear Cases			available	available
Electrical Control	available	available	available	available
Cylinder Control	available	available	available	available
Square Bottom		available	available	available
Indicator	available	available	available	available

WRITE FOR BULLETIN 59

LOW PRESSURE VALVES CAN BE FURNISHED IN THE ABOVE TYPES, SIZES AND ACCESSORY EQUIPMENT. WRITE FOR DETAILS.

THE KENNEDY VALVE MFG. CO.
1036 EAST WATER ST.
ELMIRA, NEW YORK
VALVES • PIPE FITTINGS • FIRE HYDRANTS

OFFICE-WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO • SALES REPRESENTATIVES IN PRINCIPAL CITIES

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

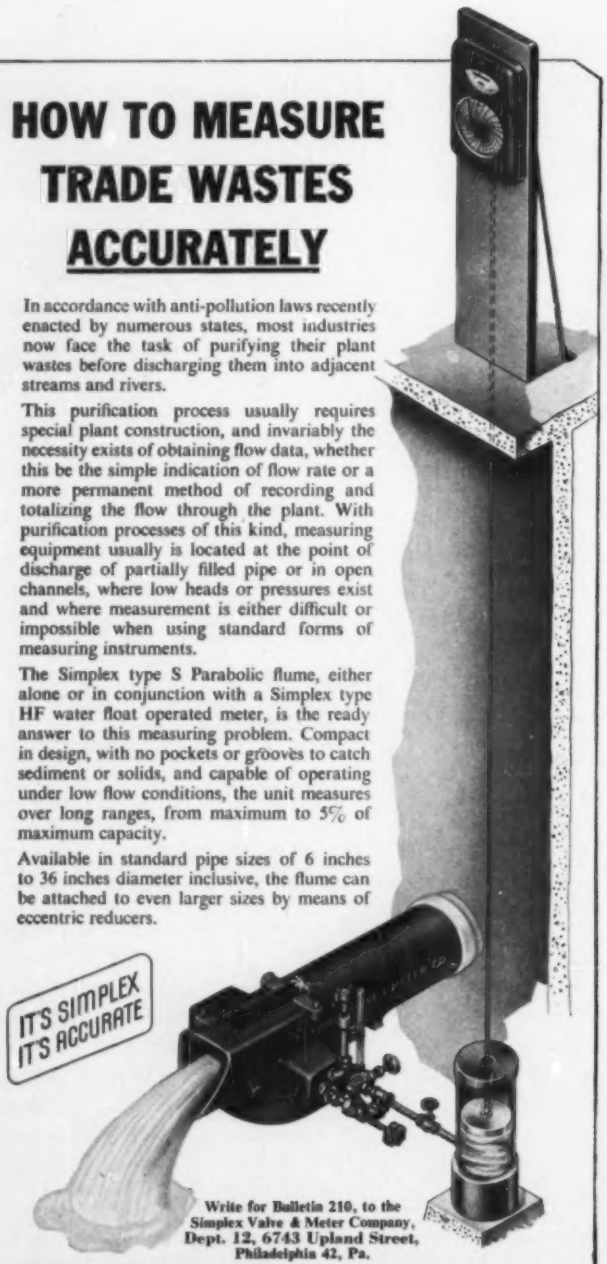
HOW TO MEASURE TRADE WASTES ACCURATELY

In accordance with anti-pollution laws recently enacted by numerous states, most industries now face the task of purifying their plant wastes before discharging them into adjacent streams and rivers.

This purification process usually requires special plant construction, and invariably the necessity exists of obtaining flow data, whether this be the simple indication of flow rate or a more permanent method of recording and totalizing the flow through the plant. With purification processes of this kind, measuring equipment usually is located at the point of discharge of partially filled pipe or in open channels, where low heads or pressures exist and where measurement is either difficult or impossible when using standard forms of measuring instruments.

The Simplex type S Parabolic flume, either alone or in conjunction with a Simplex type HF water float operated meter, is the ready answer to this measuring problem. Compact in design, with no pockets or grooves to catch sediment or solids, and capable of operating under low flow conditions, the unit measures over long ranges, from maximum to 5% of maximum capacity.

Available in standard pipe sizes of 6 inches to 36 inches diameter inclusive, the flume can be attached to even larger sizes by means of eccentric reducers.

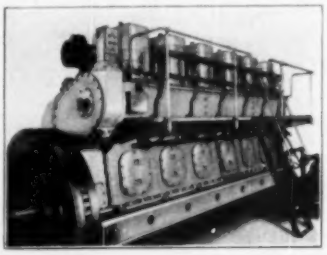


Write for Bulletin 210, to the Simplex Valve & Meter Company, Dept. 12, 6743 Upland Street, Philadelphia 42, Pa.

SIMPLEX

VALVE AND METER COMPANY

engines are four-cycle, 17-in. bore, 20-in. stroke, with speeds of 257 to 375 rpm. They are available with 6 and 8 cylinders, normally aspirated or supercharged.



The new engine was designed to provide an increased power range and at the same time reduce the size and weight per horsepower. Welded construction of bedplate, frame and cylinder housing are some of the new features.

Penn Salt Improves Portland Plant

Penn Salt Mfg. Co., Portland, Wash., has announced that it is now completing a program of improvements to existing facilities at its plant in Portland.

Mr. Fred C. Shanaman, president, stated that "storage and warehouse space has been expanded and improvements have been made to buildings and facilities for the manufacture of DDT, chlorine and caustic soda."

Caustic soda evaporation is being enlarged to permit better work schedules, said Mr. Shanaman, and additional space is being added to the chlorine cell room for cell repairs and related work.

15

Speed Indicating & Recording Instruments

O. Zernickow Co., New York, N. Y., have just placed on the market a new hand Tachometer and hand Tachograph. The O-Z Improved Hand Tachometer has a 3 in. dial, single spindle, quintuple selective range, with rotating gear shift and is made in three different range combinations for speeds 30-48,000 rpm, 15-24,000 fpm.

The new O-Z Improved Hand Tachograph has the same specifications as the Tachometer and in addition draws graphic charts of speeds on a traveling paper strip. The time is marked horizontally and the speed vertically. Both instruments indicate or record, without timing or calculat-

(Continued on page 99A)

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

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Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

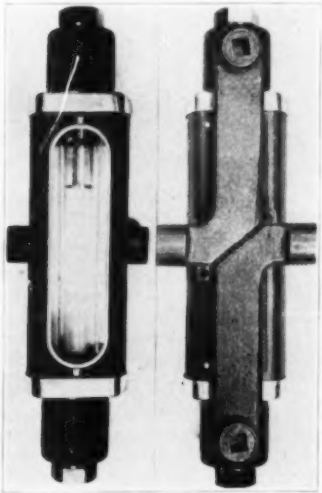
(Continued from page 98A)

ing rpm. and fpm speeds, speed fluctuations, accelerations, decelerations, belt slippage, and accuracy is said to be within 0.5 per cent at any point of the scales.

16

Flow Meter for Horizontal Piping

Fischer & Porter Co., Hatboro, Penn., has made available an adapter for installing Flowrator meters in horizontal process piping. This elim-



inates the necessity for a vertical rise in a line where head room is at a premium. The horizontal line adapter is constructed of a number of corrosion-resistant materials, and may be supplied for use with all standard meters. Where necessity of vertical runs made it impossible before, eye-level flow indication for accurate instrument reading, is now made possible by this adapter.

R. A. Haworth Appointed by Cutler-Hammer

Cutler-Hammer, Inc., Milwaukee, Wis., has appointed R. A. Haworth as manager of the Dallas district sales office, according to an announcement made by P. S. Jones, Vice President in charge of sales.

Mr. Haworth joined the company in 1934 upon his graduation from the University of Wisconsin and after serving in the headquarters sales department he was transferred to the New York District, later to the Philadelphia district and upon opening of the Baltimore sales office in 1936 he

May we assist you, sir?

If you're on a merry-go-round about handling air or gas, *R-C dual-ability* can help you.

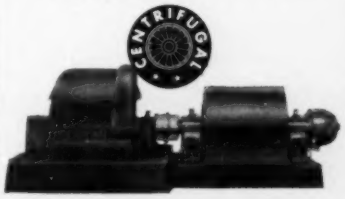
That's been our exclusive job for almost a century. We've developed the most extensive line of blowers, exhausters and gas pumps in the industry, with capacities from 5 cfm to 100,000 cfm.

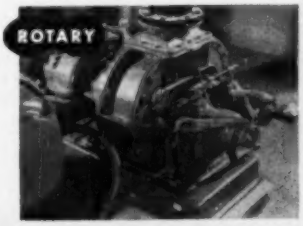
We're the only builders offering that *dual choice* of both Centrifugal and Rotary Positive equipment. Thus, without bias, we can suggest units that meet most closely the requirements of the work to be done.

For new installations or replacements, look to us for your needs. Alert engineering teams up with modern construction to insure long-time, satisfactory performance of R-C equipment.

ROOTS-CONNERSVILLE BLOWER CORPORATION
512 Mount Avenue, Connersville, Indiana

One of three Type H, 3-stage Centrifugal Blowers in large sewage disposal plant. Capacity 15,000 cfm, driven by 700 hp electric motor.





Type HD Rotary Positive Blower in sewage disposal work. Variable capacity from 491 cfm to 1,000 cfm. Motor driven.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

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Rates... FROM $2.50
A TOOLEY OPERATED HOTEL
HOTEL CLARK
426 S. HILL ST.

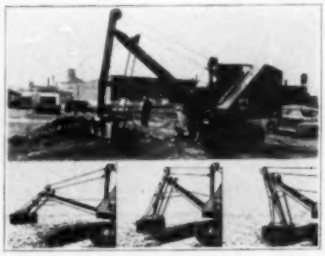
was appointed manager and held that position until his Dallas appointment.

As manager of the Dallas office he will supervise the Tulsa, Houston and Midland sales offices.

17

Backfill Blade Attachment

Schield Bantam Co., Waverly, Iowa, has announced a revolutionary new backfill blade attachment, which greatly speeds covering and leveling all types of excavation and trenching work.



Designed for fast, interchangeable operation with the ¾ yard truck-mounted trench hoe, the new backfiller consists of a cable-operated steel blade mounted on a wishbone dip stick, with two tubular control arms, which hold the blade VERTICAL to the ground as it is pulled toward the machine. The manufacturer claims this exclusive "dozer action," plus exceptionally fast mechanical controls, enables the Bantam blade to "roll" big loads of dirt into a trench much faster and easier than old scoop-type backfillers.

Equipped with heavy-duty 24 x 60 inch blade with ½ inch reversible cutting edge, the attachment is reported to have a maximum reach of 23 feet 6 inches in any direction and can also be controlled vertically to within 1 inch of the ground surface.

18

Flow Controller

Penn Industrial Instrument Corp., Philadelphia, Pa., has announced a new automatic Flow Controller which provides lower maintenance with higher accuracy and fast response. Flow rate is measured by the Penn Magna Clutch Flow Meter which a frictionless magnetic coupling between the float and the pen and control mechanism. Highest accuracy is achieved by the large float and long float travel combined with true frictionless design. To this is added the sensitive pneumatic controller which is equipped with fully adjustable automatic reset and

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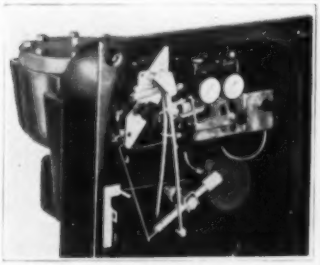
proportional band adjustable from 0—175 per cent.

A principal source of trouble in conventional meters is eliminated by



use of a stuffing box or pressure tight bearing and use of "O" ring manometer seals in place of gaskets. The manometer is fully accessible without disconnecting the pressure piping; there is only one moving part, the float, which can easily be removed. Both nozzle and restriction have sapphire jewels to prevent wear, restriction may be cleaned while in service, entire controller or just the control head may be removed from case with a minimum of effort.

Minneapolis-Honeywell Sets Up Field Sales Unit

Minneapolis-Honeywell Regulator Co., Philadelphia, Pa., has set up an independent field sales organization for its Valve division. The nucleus of the new organization will consist of regional sales managers and a staff of upwards of 20 who will provide national coverage.

K. R. Knoblauch, Sales Manager, stated that "the company has just completed training the first group of field salesmen at the Valve School in Philadelphia" and announced the following appointments.

Eastern region—R. Schlegel, Manager, with New York headquarters.

Mid-Atlantic region—T. L. Smith, Manager with Philadelphia headquarters.

Central region—George W. Brown, Manager with Cleveland headquarters.

Mid-west region—R. R. Scott, Manager with Chicago headquarters.

Southeast region—L. Crowe, Atlanta.

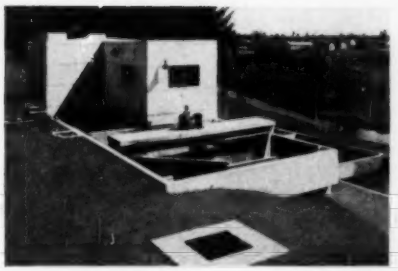
Southwest region—C. F. Woods, Manager with Houston headquarters.

The Mountain, North Coast and Pacific regions will be managed by W. A. Clements with Los Angeles headquarters, and the Northwest region by R. R. Scott.

Ideal for small communities, isolated institutions, outlying plants

YEOMANS SEWAGE TREATMENT PLANTS

. . . Activated Sludge Process or Biological Trickling Filter



The "PACKAGE" AERIFIER

Many small communities and outlying institutions, compelled to purify wastes but lacking an ample supply of diluting water, have found in the Yeomans "Package" Aerifier an ideal answer to a critical problem.

Compact, exceedingly efficient in purification, unique for low construction and operation costs, this activated sludge plant provides aeration and final sedimentation in a single concrete unit. Operation is as simple as possible, with supervision limited to routine check-up. Every installation includes final adjustment, initial tested operation, thorough training of operators and continuing counsel from Yeomans engineers.

"WATER-WHEEL" DISTRIBUTOR

Operating in conjunction with a primary sedimentation tank, the Yeomans "Water-Wheel" Distributor applies settled sewage to a trickling filter—with unfailing dependability. Sewage flows into the rotating trough, and is spread evenly on the filter bed through V-notches and spreader plates. The trough is actuated by a water-wheel and bevel gearing. Filter beds range from 5-foot to 25-foot diameters; and the entire area is effective for treatment. Continuous positive distribution is assured at all rates of flow—which does away with need for dosing chambers and siphons. There is none of the clogging and cleaning of spray nozzles often required with reaction distributors; and elimination of accessories saves as much as the entire cost of the complete Water-Wheel installation. Maintenance is extremely simple. Numerous Water-Wheel plants—small communities, hospitals, airports, industrial plants—provide impressive proof of this unit's extraordinary efficiency.

Helpful engineering data on these Yeomans plants will be sent promptly upon request—no obligation.

YEOMANS

PUMPS FOR BUILDINGS, MUNICIPALITIES, INDUSTRIAL APPLICATIONS — and a complete line of Sewage and Waste Treatment Equipment

Yeomans Brothers Company
1423 North Dayton Street, Chicago 22, Illinois

Please send information as follows:
☐ Yeomans "Water-Wheel" Distributor
☐ Yeomans "Package" Aerifier

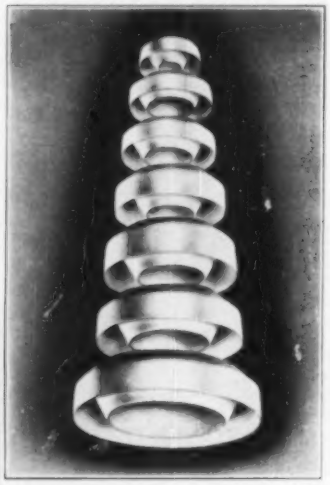
Name_____
Address_____
City_____ State_____

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

19

Teflon V-Ring Packings

Crane Packing Co., Chicago, Ill., has announced the perfection of "V-Ring" type packings molded from pure teflon. Molded by a specially developed process, these V-type packings combine the chemically inert and frictionless properties of Teflon with the resilience and toughness needed for proper sealing results. A special cross-section design insures permanent sealing, even under varying pressures, at temperatures up to 450° F. Teflon "V" Rings are available in many standard sizes and additional sizes will be specially molded to meet specific requirements, according to the company.



Sterling Acquires New Plant Site

Sterling Electric Motors, Inc., Los Angeles, Calif., has acquired an 11 acre site in Van Wert, Ohio, for the construction of a branch plant to serve the company's mid-western and eastern business, according to Carl E. Johnson, Board Chairman. Plans and specifications for the new plant building and equipment are currently being prepared and it is estimated that the new Van Wert site will represent an investment close to a half million dollars. Executive offices will be maintained in Los Angeles.

20

Leakproof Fitting

Crawford Fittings Co., Cleveland, Ohio, has developed the Swagelok Fitting which, according to the company has completely eliminated the bothersome small leaks. This fitting provides a vacuum tight seal. Two ferrules and the threaded chuck inside the Swaglok nut clinch tight around the tubing wall, providing a leakproof seal. The company states that laboratory tests have demonstrated the tubing will burst before the fitting will leak.

Swaglok fittings are recommended to overcome problems involving

MERIT PROVEN *in* MANY INDUSTRIES

Aurora Non-Clog Pumps are available in both vertical and horizontal types—and are widely used in industry for handling liquid products, particularly heavy liquids and liquids containing solids. Also used for industrial by-products, semi-solids, wastes, municipal sewage etc. For impressive specifications and design features ask for BULLETIN 121-C.

Type Ku Aurora Vertical Non-Clog Pump. Sizes to 10".

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS — AURORA PUMP COMPANY

68 Loucks Street — Aurora, Illinois

Electroforged into one piece for STRENGTH

Self-cleaning • Easily Maintained • Maximum open area • Simple to cut and bend for fitting around obstacles • Adaptable to many uses.

Blaw-Knox Electroforged Stair Treads available with rolled diamond checker plate nosing, twisted cross-bar nosing or abrasive nosing.

and SAFETY

NON-SLIP — the twist does the trick • Maximum safety and strength . . . that's the ideal combination in Blaw-Knox *electroforged* Steel Grating. Each individual joint is electrically forged together in a union stronger than the surrounding metal! The twisted bar construction gives a firm grip on shoe soles, makes slipping impossible.

WRITE FOR BULLETIN 2296

BLAW-KNOX DIVISION of Blaw-Knox Company

2051 Farmers Bank Bldg., Pittsburgh 22, Pa.—Offices in Principal Cities

BLAW-KNOX ELECTROFORGED STEEL GRATING

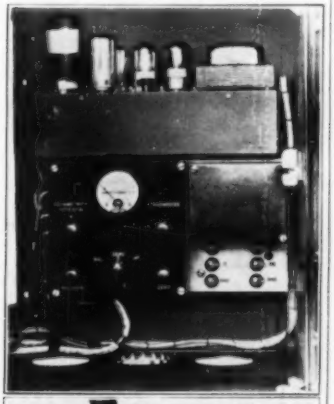
If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

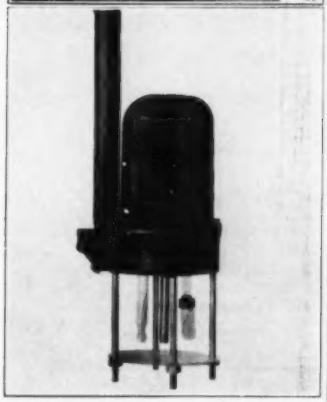
pressure, vibration and torque. They are available in brass, monel, aluminum, steel, stainless steel, and are made in a range of sizes for use with tubing ⅛ to 1 inch outside diameter.

21

Compact Multi-Use pH Recorder

Cambridge Instrument Co., Inc., New York, N.Y., have announced the availability of their Cambridge pH Recorder. Some of the features claimed for the recorder are: compactness, all component parts, namely, the electrometer system, recorder unit and voltage regulated power supply form an integral unit within the recorder case; excellent shielding

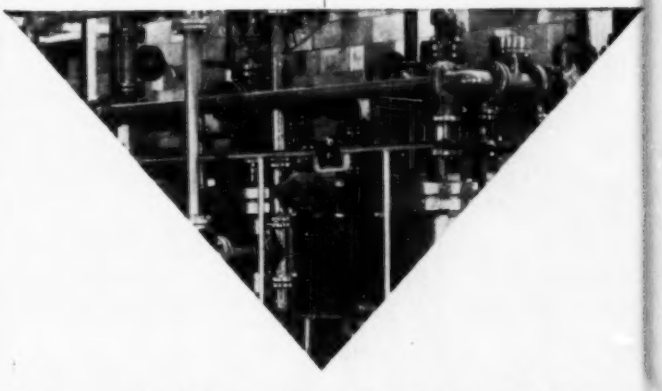




with polyethelene cable and minimized leakage problems; stability within a quarter division of scale reading; accuracy of 0.1 pH; recorders will automatically measure and record pH at 2, 3, 4, or more stations and a universal type electrode assembly is furnished, for either immersion or flow type applications. These units find use in many industrial waste treatment plants.

SARAN LINED steel pipe

cuts repairs and replacements to a minimum!



The conveyance of corrosive liquids can prove as hard on profits as it is on equipment. It's this realization that has compelled more plants than ever before to install corrosion-resistant saran lined steel pipe. Saran's resistance to most chemicals and solvents reduces shutdowns and lost production! Saves time and labor!

Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 6 inches inclusive. Also available are saran lined diaphragm valves, plug valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends.

Write us today for further information concerning saran lined steel pipe and how it may help solve your corrosion problems. Manufactured by The Dow Chemical Company, Bay City, Michigan, distributed by Saran Lined Pipe Company, Dept. TSP-70.

Distributed by

Saran Lined Pipe Company

701 STEPHENSON BUILDING • DETROIT, MICHIGAN

Offices in: New York • Boston • Philadelphia • Pittsburgh Chicago • Tulsa • Indianapolis • Houston • San Francisco Los Angeles • Portland • Cleveland • Denver • Seattle Charleston, S. C. • Toronto

SARAN LINED PIPE a DOW product

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

22

"Flex-I-Liner" Pump

Vanton Pump Corp., New York, N.Y., has announced the development of a new Vanton Pump, using a specially formulated rubber "flex-i-liner"

which can adequately withstand highly corrosive liquids or gasses. The pump contains no stuffing boxes, no gaskets, no valves, the construction is such that the fluid flows on the outside of the "flex-i-liner" and on the inside of the body block. An eccentric rotor mounted on a ball bearing rides inside and activates the "flex-i-liner." The "squeegee" action thus created is the basis of the pump operation. The unit is of the positive displacement type and self-priming.

Bailey Meter Assigns New Field Engineers

Bailey Meter Co., Cleveland, Ohio, has assigned five engineers to new branch office posts to meet increased demands for expert engineering services. The five men are all graduates of the company's training program which consists of classroom, factory and field training in the theory and practice of measurements and controls. The names and new business addresses of the five engineers are: P. K. Bolyard, Atlanta, Ga.; L. F. Manahan, Denver, Colo.; R. E. Paulson, Kansas City, Mo.; George J. Dunegan, San Francisco, Calif., and O. M. Thompson, Cincinnati, Ohio.

23

Safety Tape Labels

Fisher Scientific Co., Pittsburgh, Pa., announces the availability of cellulose tape, printed in vivid colors with the words "Poison," "Corrosive" and "Flammable" in convenient roll form with a heavy cast dispenser. The tape is recommended as a safety precaution for marking all reagent bottles, packages, etc., that are handled by individual workers.

The tape is ½ inch wide, and each printed portion, when cut off by an

integral serrated edge, is about 3½ inches long. Each roll contains approximately 200 printed portions.

All three rolls are held in the dispenser with the free end of each roll adhering to the cut-off edge for in-

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NOW TRADE-IN YOUR OLD PIPE LOCATOR
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Quickly and accurately locates position and depth of pipes, toes, valves and buried tools.
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4 REASONS
why more miles of cast iron water mains are jointed with LEADITE than with any other melted self-caulking material:
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100 Lbs. LEADITE CEMENT
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Girard Trust Co. Bldg., Philadelphia 2, Pa.
No Caulking

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

stant use. The "Poison" label is printed with yellow letters on a black background; "Flammable," red letters on white; and "Corrosive," black letters on yellow.

Killeen Joins DaLee

William A. DaLee, Inc., Detroit, Mich., has announced that Robert F. Killeen, formerly on the staff of Pate & Hirn Engineers, has joined the company in a sales capacity. He will specialize on water and sewage problems. Kileen has worked as an engineer in the design of sewage and water filtration plants while with Pate & Hirn. Prior to the war he was with the engineering division of the Michigan Department of Health specializing on Sewage Treatment Plants.

24

Cleaning Sewage Plants

Malsbary Manufacturing Co., Oakland, Calif., has immediately available High Pressure Combination Steam Cleaning units for an efficient, economical and speedy means of combatting the cleaning problems in sewage disposal plants. These units, capable of performing effectively from remote stations, are job engineered for sewage disposal installations and provide a method for removal of concentrations of congealed sludge. These cleaners will supply high pressure water, hot or cold, at 400 lb. pressure and steam cleaning at 150 lb. pressure at 320 degrees.

The units are fully automatic. The fire is controlled first by a thermopilot that in case of a pilot failure, the gas is shut off. There is a thermostatic control to maintain a constant temperature and a flow control valve that shuts off the fire as the flow of water through the coil ceases. These cleaners can be adapted for complete operation from a remote station.

Atlas Mineral Appoints Dr. Steiner

Atlas Mineral Products Co., Mertztown, Pa., through the president, Mr. George L. Wirtz, has announced the appointment of Dr. Robert H. Steiner as Research Coordinator. Dr. Steiner received his B.S. degree with highest honor at the University of Pittsburgh and his Ph.D. degree at the same institution. He has been employed by the Firestone Tire & Rubber Co. for the past seven years.

"Application of activated silica sol reduces the raw water color by 95%."
CHEMICAL ENGINEER
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Now, water that formerly ranged from 150–400 ppm color is clear and sparkling. In addition, this plant uses N-Sol-A coagulant aid to increase its capacity from 2000 gallons per minute to 4000 gallons.

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N-Sol-A coagulant aid is prepared in your plant from our "N"* Silicate of Soda reacted with ammonium sulphate. Other N-Sol Processes use chlorine, alum, or sodium bicarbonate as reactants.

*Reg. U. S. Pat. Off.

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Manufacturers of Soluble Silicates
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We can similarly solve your problem if you have an old leaky or disintegrated reservoir. We invite you to call on us for complete information, recommendations or estimates on any "GUNITE" work which you may be planning.

Many instances of repair, remodeling and new construction with "GUNITE" are described and pictured in Bulletin C2400. A request on your letterhead will bring your free copy by return mail.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA. U.S.A.
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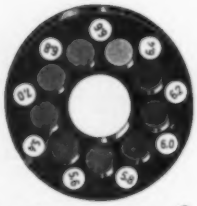

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Pipe Line Equipment

New Hyde Park **New York**

LITERATURE AND CATALOGS

25

ASBESTOS YARNING ROPE

Johns-Manville, New York, N.Y., has just published a 4-page folder explaining the use of **"Asbestos Yarning Rope"** for yarning bell and spigot joints in water lines.

The advantages claimed for this rope are explained on page two as: 1. Will not support bacterial life, 2. Will not contaminate water, 3. Easy to handle, and 4. Packs joints tightly. Recommended methods of application are also told on this page.

The different types of Asbestor Yarning Rope—plain, rubber-coated, copper-jacketed—are illustrated and described on page three. Page four is devoted to tables showing standard sizes, feet per pound and packaging of the material, as well as data for determining the size and amount of rope needed for any number of joints in pipe sizes from 4 through 60 inches.

26

WATER CLARIFICATION

Cochrane Corp., Philadelphia, Pa., has just published a bulletin describing the **Cochrane Liquon Sludge Contact Reactor,** a water conditioning apparatus that takes advantage of the well-known chemical principle that previously formed precipitates added in the form of sludge or slurry will accelerate reactions.

The bulletin details the principle as applied to the sludge-contact reactor, describes the operation, illustrates and describes the types of equipment available, gives a list of applications with a separate page on waste recovery and auxiliary equipment. Photos of typical installations are also shown.

27

CENTRIFUGAL PUMP

De Laval Steam Turbine Co., Trenton, N.J., has just released an 8 page 2-color bulletin on the **De Laval GS Pump.**

Features of the pump are described as, a factory service and exchange plan, elimination of stuffing box trouble, and elimination of all lubrication. A cross-section drawing with explanatory text covering all parts, rating tables and dimension drawings is also included.

ROTO-TROL

940

Write for Bulletin

THE 940 Roto-Trol will control your pumps, valves, alarm circuits, etc., all from one float. Each circuit is completely independent from all others, and may have several starting and stopping positions on both a rising and falling level. Can be set on the job. No special tools or experience required. All circuits, from two to ten or more, are made through snap action of mercury switches.

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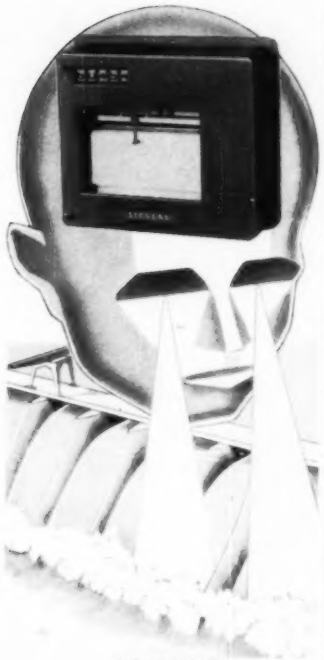

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Whether you need a simple staff gage, float gage or complex remote operated recorder, there is a STEVENS instrument to meet your requirements. Water level or flow recorders for weekly service or long periods of unattended operation, direct float operated or remotely controlled; indicators, controls for alarms and pumps . . . the STEVENS line is complete in the field of water measurement and control. We also welcome inquiries concerning special problems.

Pioneers in the field of water level recording for more than 43 years, LEUPOLD AND STEVENS INSTRUMENTS, INC., have developed and perfected precision water measuring instruments of all types to meet a variety of specific needs, especially for water works, sewerage, irrigation and industrial uses.

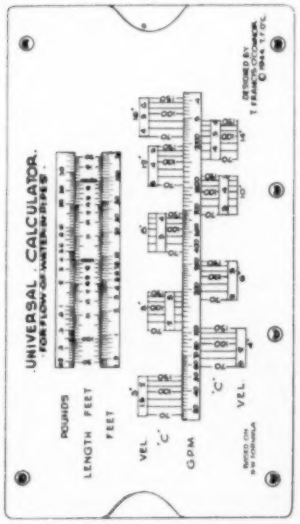
Write for literature and information on accurate and dependable STEVENS water measuring instruments.

LEUPOLD AND STEVENS INSTRUMENTS, INC.
PORTLAND 13, ORE., U. S. A.

28

WATER FLOW CALCULATOR

Grinnell Company, Inc., Providence, R.I., has developed a universal calculator for flow of water in pipe sizes 3 through 16 inches and an accompanying 23 page booklet on



"A Rapid Method of Analyzing Flow in Water Distribution Systems Based on the Theory Developed by Professor Hardy Cross."

The calculator gives simultaneous and instantaneous readings for length of pipe, size of pipe, coefficient of pipe, flow in gallons per minute, velocity in pipe and total pressure loss in both pounds and feet for given length of pipe.

Pocket size, this handy calculator, measuring four by seven inches, contains twelve windows and when set up showing the flow through a certain pipe size with the desired coefficient and knowing the length of the pipe, one can read all the other factors without moving the slide. Anywhere the slide is set, all figures visible in all of the windows are true simultaneously.

29

SEWER JOINT COMPOUND

Atlas Mineral Products Co., Mertztown, Pa., has just published a bulletin on **Atlas G-K Sewer Joint Compound.** The bulletin covers in detail the various advantages of using the G-K compound and recommendations for correct usage.

Photographs and text cover the six steps for properly using G-K; Melting compound, pouring joints on

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Let us give you a
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Adams "ONE-MINUTE"
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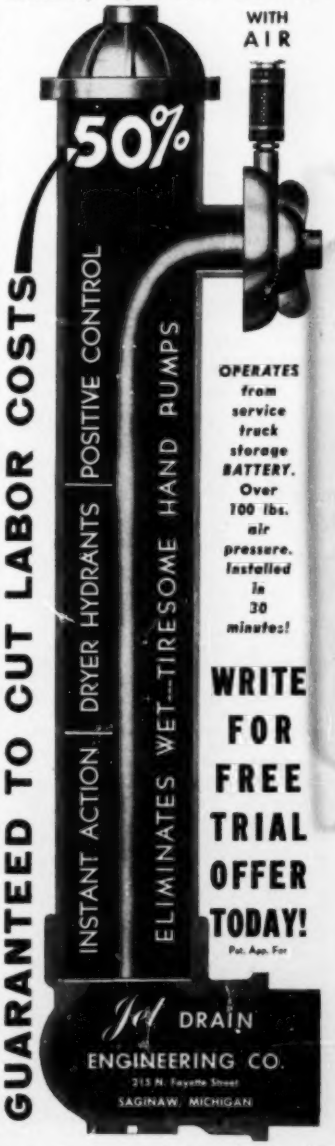
Will drain any standard FIRE PLUG absolutely dry in SIXTY SECONDS.



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PURE WATER
1450 B. C.

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SEWAGE CORROSION

WITH FORMULA No. 640
a clear liquid penetrating (1"+) sealer for concrete and masonry preventing water absorption and reducing the action of acids. Holds 12' hydrostatic head. Use our Hayproc Rubberized Enamel for color on walls and floors—not affected by concentrated acids, alcohol, oil, or traffic abrasion.

30 OTHER PRODUCTS
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822 E. 8th St. Erie, Pa.
Engineers and Sales Agents

the bank, yarning pipe to be jointed in trench, positioning runner, pouring joint in trench and the finished joint with runner removed.

30
SOLIDS, GRIT & SCUM REMOVER

The Dorr Co., Stamford, Conn., has just published a new 12 page, two-color bulletin on **"The Dorrco Vacuator."** The bulletin describes the Vacuator as a compact, high capacity unit utilizing the principle of controlled vacuum flotation to remove solids, grit and scum from sewage and industrial wastes. Some of the technical information included is that the unit operates at overflow rates of from 5,000 to 10,000 gal. per sq. ft. per 24 hr.; it makes a three product separation of: grease, scum and light solids—sludge containing substantial quantities of grit—and in an improved effluent for subsequent treatment. The bulletin describes the Vacuator in detail, including photographs, drawings, and design data. In addition three pages are devoted to operating results from practice, and cover plant descriptions, flowsheets and plant removals.

31
LABORATORY CHEMICALS & EQUIPMENT CATALOG

The Burrell Corporation, Pittsburgh, Pa., has announced a new 986 page hand book, **Catalog No. 450,** that is all-inclusive and an up-to-date reference work on all kinds of laboratory apparatus and supplies. It lists over 25,000 items and included many improved methods and aids for chemical analysis and testing. The company states that over four years of research and preparation have preceded its publication. One feature of the catalog is the convenient and helpful cross index system. Items are listed by name and again, separately, by function. A complete description of each item accompanies every listing.

The catalog weighs about 7 lbs. and is bound in durable green leather.

FOR SALE

Peerless Deep Well Pump, 200 g.p.m. equipped for 200 ft. depth, 25 stages 6" H bowl assembly, 20 hp 1800 RPM 220 V, G.E. splash proof motor with starter. Good as new as it was used less than 3 months—details and price furnished to interested parties.

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32
STRIP-CHART INSTRUMENTS

The Bristol Co., Waterbury, Conn., has made available a new bulletin describing the company's new line of **Series 500 Strip-Chart Dynamaster Electronic Instruments.** The bulletin gives information concerning the new instruments for recording and indicating. In addition to the recording models, pneumatic and electric-operated automatic control models are also described. The bulletin is liberally illustrated with photos of various models, reproductions of chart records, and schematic drawings. Photographs of several interesting installations of the newly-announced instruments are also included.

33
CENTRIFUGAL PUMP GUIDE

Allis-Chalmers, Milwaukee, Wis., has just released a new 16 page bulletin entitled **"Handy Guide to Selection of Centrifugal Pumps."**

A wide variety of units are indexed in this bulletin including close-coupled, pedestal, double suction single stage, multi-stage, self-priming, fractional horsepower, collant and circulating, fire, process, solids handling, marine, rubber-lined, paper pulp, sewage, axial, and mixed flow pumps.

Head capacity charts and tables for various types of the pumps are given along with data on sizes, capacities and construction features.

34
FOAMGLAS

Pittsburgh Corning Corp., Pittsburgh, Pa., has issued a new booklet on **"PC Foamglas."** This is a long life insulation for commercial, industrial and public buildings. The bulletin describes the installation of Foamglas, the use of the material as wall lining and other purposes. It is possible that it might find application for the insulation of sludge digestion tanks, as well as other places in water and sewage plants.

35
PRESSURE TANK CONTROLS

Automatic Control Co., St. Paul, Minn., has printed a 4-page 2-color bulletin on **Autocon Duotrols.** This attractive bulletin explains how Duotrols combine an inter-relates the independent functions of both pressure and float control for either horizontal pump or deep well installations. Complete diagrams dem-

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to WATER WORKS and SEWAGE MEN

HOW TO CONTROL ALGAE

"The Use of Copper Sulphate in Control of Microscopic Organisms" by Dr. Frank E. Hale (former Director of Laboratories, Dept. of Water Supply, City of New York) is an authoritative work concerning the control of micro-organisms and elimination of taste and odors. Describes in detail methods of controlling various forms of microscopic life commonly encountered in water supply systems. Contains descriptive material, plus 48 photo-micrograph studies of organisms discussed.

ROOT AND FUNGUS CONTROL

"Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains," by John W. Hood, contains information published for the first time. This material includes actual methods for control and operating procedure. Here's the book that is a "must" for all sewage men.

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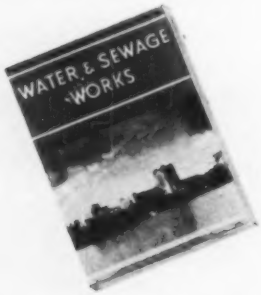

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Testimonials such as this from subscribers to WATER & SEWAGE WORKS really tell the story. The man who reads and uses the magazine as an aid in his work knows how much it will benefit other workers in the field.

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- *If you are interested in sewage problems only you are kept fully informed and given much help in this field.*
- *If you are interested in both subjects you get all the information in this one monthly magazine.*

onstrate the actions performed by the controls. Suggestions for better pressure tank installations and tables showing water withdrawn (% of total tank capacity) for any given pressure drop from selected high pressure at high levels of 50, 40 and 30 per cent of total capacity complete the bulletin.

36
INDUSTRIAL WATER PROBLEMS

Hall Laboratories, Inc., Pittsburgh, Pa., has released a new booklet entitled **"Your Most Important Raw Material"** which describes and charts industrial water problems of all kinds — procurement, treatment, usage and disposal.

Pointing up the importance of water in all kinds of industries and industrial operations is a front-cover illustration diagramming the amount of water needed to produce a ton of each of several kinds of products—830 tons of water for each ton of rayon, 400 for paper pulp, 160 for wood fabric, 130 for synthetic ammonia, 100 tons for steel, 65 for industrial alcohol, and 15 tons for gasoline.

Various kinds of industrial water problems, such as plant-wide water service, practical and economic solutions to water supply are discussed along with photographs of services performed in the Hall Laboratories.

37
CAUSTIC SODA ECONOMIES

Fischer & Porter Co., Hatboro, Pa., has just published a booklet on **Economic Handling of Caustic Soda with Variable Area Meters.** The booklet deals with the advantages of purchasing high-concentration caustic soda and diluting immediately during unloading, thus saving freight costs by shipment of less water. Special meter design, piping arrangements, dilution calculations and pump layout are also discussed in detail.

Caustic uses throughout the plant are included, as well as meter banks for economical pumping, and control instruments used in maintaining pH are also developed.

38
DRAINAGE PIPE

Armco Drainage & Metal Products, Inc., Middletown, Ohio, has just issued a 6 page folder entitled **"Here's the Drainage Structure with a 'One-Two' Punch"** which describes the structural strength and material durability of Armco Asbestos-Bonded Pipe to withstand severe conditions. It also describes how the pipe is made. Photographs illustrate test installations and installations of industrial sewers and culverts in marshy and salt water conditions.

39
SARAN LINED PIPE

Dow Chemical Co., Midland, Mich., announces the availability of a new catalog on **Saran Lined Steel Pipe, Fittings, and Valves.**

The catalog deals with the properties and fabrication of Saran lined steel pipe, fittings and valves. Photographs, cross-section, and dimensional drawings are also included.

40
SODIUM ALUMINATE TREATMENT

The Merrimac Division of Monsanto Chemical Co., Everett, Mass., has issued a booklet describing **Sodium Aluminate Treatment** of industrial and municipal water supplies.

The literature discusses the reaction of sodium aluminate as a water softener and clarifier. In addition, the pamphlet covers treatment of boiler feed water, internal boiler water treatment and preparation of sodium aluminate solutions.

Leopold

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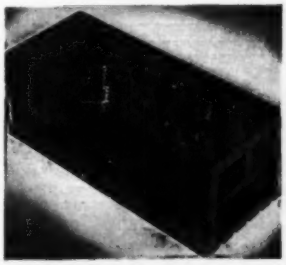

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Complete water purification and sewage plant equipment.

Write today for complete information

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SEWAGE TREATMENT

The Bio-Chemical Process (a Guggenheim development) is a proved, economical, complete treatment of sewage—lowest first cost—lowest operating costs, utilizing community trade wastes to treat sewage.

Investigate this process without cost or obligation.

(If you counted only 34 words, you probably didn't realize that "economical" and "proved" are doubly important in connection with the Bio-Chemical Process)

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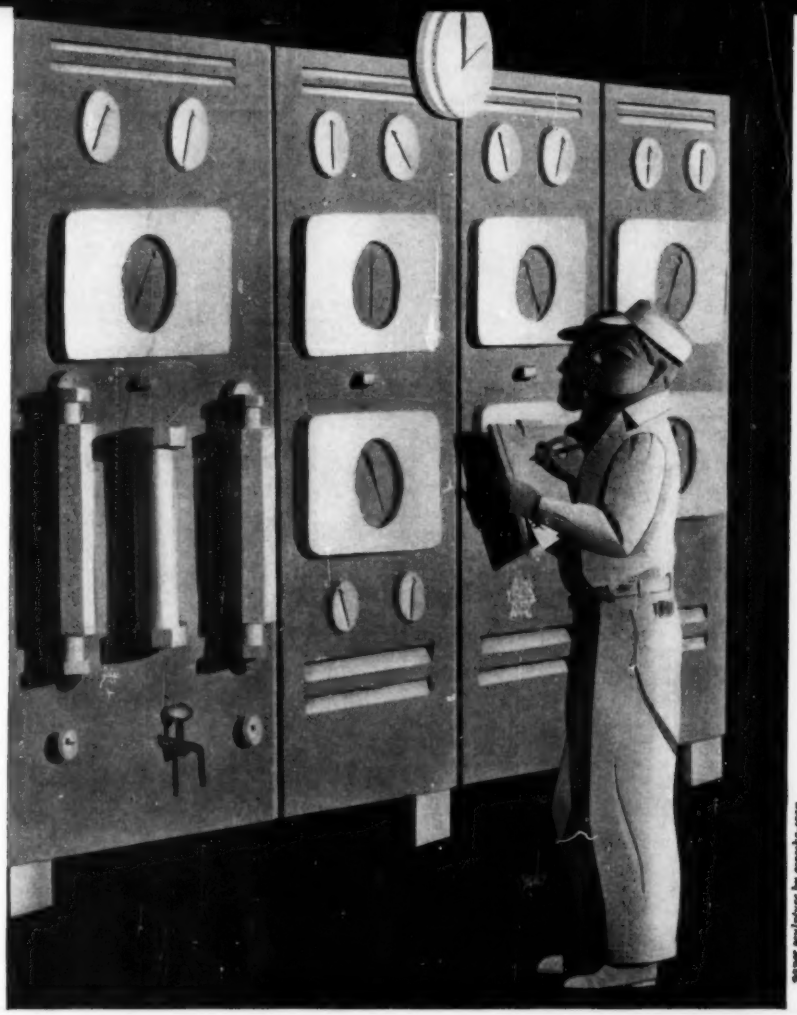

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